

# Pacific Islands

Great Britain.

Hydrographic Dept

*(To be pasted on inside of cover of all Sailing Directions.)*

# NOTATIONS OF SUPPLEMENTS OR HYDROGRAPHIC NOTICES RELATING TO THIS BOOK.

To be filled in by Navigating Officer  
[In Chart Depôts the two first columns are alone to be filled up.]

Whether Supplement or Hyd. Notice.	Date of Publication and Number.	Whether pasted in or noted in Margins of Book, and Date of such correction.

8 (3)3928. 400.—6/98. Wt. 6020. E. & S.

VK  
798  
.G7

Sup. 1920  
D. of D.

**Dup. U. of C.**  
**L. B.**

**OFFICIAL COPY.**

**PACIFIC ISLANDS, VOL. III.**  
**(EASTERN GROUPS.)**

---

**SAILING DIRECTIONS**

FOR

TUBUAI, COOK, AND SOCIETY ISLANDS; TUAMOTU  
OR LOW ARCHIPELAGO; MARQUESAS;  
LINE ISLANDS OR SCATTERED ISLANDS NEAR THE  
EQUATOR; SANDWICH OR HAWAIIAN  
ISLANDS, &c.

THIRD EDITION,  
1900.

---

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

---

LONDON:  
PRINTED FOR THE HYDROGRAPHIC OFFICE, ADMIRALTY,  
By EYRE AND SPOTTISWOODE,  
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY;  
AND SOLD BY  
J. D. POTTER, AGENT FOR THE SALE OF ADMIRALTY CHARTS,  
31, POULTRY, AND 11, KING STREET, TOWER HILL.  
1900.

*Price Three Shillings.*

*52 62*



I

4

By transfer

JUN 17 1914



*Copy  
of the  
original  
edition  
of the  
work*

## ADVERTISEMENT TO THIRD EDITION.

At the last revision of this work, in 1891, it was incorporated with Pacific islands, Vol. II. The second edition of Vol. III. did not, therefore, appear separately, but formed practically the last five chapters of the second edition of Vol. II., published in 1891. This arrangement not having been found in all respects convenient, the present edition of Vol. III. again appears as a separate publication.

The area embraced by this volume comprises a few outlying rocks and islands, and the following principal groups:—Tubuai, Cook, and Society islands; Tuamotu or Low archipelago; Marquesas; Line islands; Sandwich or Hawaiian islands, with the islands stretching away north-westward of them.

The first edition was compiled by Lieutenant G. E. Richards, R.N., and prepared for the press by Lieutenant G. C. Frederick, R.N., of the Hydrographic Department, in 1835. The main sources of information as regards the several groups were as follows:—Tubuai and Cook islands, the descriptions of Captain Cook, 1769–77, and Admiral Krusenstern, Russian Navy, 1803; Society islands, Captain Wallis, 1767; Cook, 1769–77; Beechey, 1826; FitzRoy, 1835, and detailed surveys by the French officers since 1844. Tuamotu archipelago, Le Maire and Schouten, 1616; Cook, 1769–74; Beechey, 1825–26; Captain Wilkes, U.S.N., 1841; reports by French officers exploring and surveying among the islands of the group. The Marquesas islands, Cook, 1774; Krusenstern, 1803; French officers' surveys. Sandwich or Hawaiian islands, Cook, 1778; Vancouver, 1793; Belcher, 1838; Wilkes, 1841; Rev. Wm. Ellis, in "Polynesian Researches," 1853; surveys by officers of the Hawaiian Government.

The second edition was prepared by Staff Commander W. H. Petley, R.N., of the Hydrographic Department, and incorporated, as before stated, with Vol. II. in the year 1891.

The third edition has been prepared by Captain E. H. Hills, R.N., much additional information having become available since 1891.

The work accomplished by French officers, embodied in "Instructions Nautiques de l'Océan Pacifique Sud," and published in 1894, has been of great use as regards the southern groups; whilst the valuable scientific researches by the United States have greatly increased the knowledge of the winds and currents of the North Pacific, and the acquisition of the

Hawaiian group by that power is bringing to light many new facts concerning those islands.

Much useful information has also been derived not only from the Remark books and reports of officers of the Royal Navy and Mercantile Marine, but also from the national and mercantile navies of many countries navigating these waters, as well as from officials stationed in the various islands.

Seamen are invited to transmit to the Secretary of the Admiralty notice of any errors or omissions they may discover in this work, as well as any additional information they may obtain, with a view to its future improvement and correction.

By the publication of "Pacific Islands," Vol. III., third edition, the portion of the second edition of Pacific Islands, Vol. II., relating to the eastern island groups of the Pacific, from page 273 to the end, as also Hydrographic Notice, No. 7, of the year 1895, together with all Notices to Mariners up to and inclusive of No. 550 of 1899, so far as they relate to this volume, are cancelled.

W. J. L. W.

*Hydrographic Office, Admiralty, London,*  
*June 1900.*

# CONTENTS.

---

## CHAPTER I.

	Pages
General information - - - - -	1
Coral reefs and island Groups - - - - -	3
Wind and Weather.—Barometer - - - - -	5-10
Hurricanes - - - - -	11
Temperature.—Depths - - - - -	12, 13
Currents.—Caution - - - - -	13-16
Vigia - - - - -	16
Coal.—Beaconage.—Dockyards.—Natives.—Missions - - - - -	19, 20
Communications.—Passages - - - - -	20-23
Trade Wind Tables - - - - -	24, 25

## CHAPTER II.

Southern outlying reefs and islands.—Tubuai, Cook, and Palmerston islands	26-46
---------------------------------------------------------------------------	-------

## CHAPTER III.

Society islands - - - - -	47-99
---------------------------	-------

## CHAPTER IV.

Rapa Nui.—Sala y Gomez.—Tuamotu or Low archipelago - - - - -	100-144
--------------------------------------------------------------	---------

## CHAPTER V.

Marquesas islands.—Line islands or scattered islands near the Equator - - - - -	145-189
---------------------------------------------------------------------------------	---------

## CHAPTER VI.

Pages

<u>Hawaiian or Sandwich islands, with the islands, rocks, and shoals westward</u>	
<u>of them - - - - -</u>	<u>190-253</u>

---

<u>Index - - - - -</u>	<u>254</u>
------------------------	------------

<u>List of Sailing Directions published by the Hydrographic Department of the</u>	
<u>Admiralty - - - - -</u>	<u>271</u>

<u>List of Admiralty Agents for the sale of charts in the United Kingdom -</u>	<u>277</u>
<u>" " " " " abroad - -</u>	<u>278</u>

---

## SYSTEM OF ORTHOGRAPHY.

*Adopted by the Admiralty for Sailing Directions and Charts.*

As far as has been found possible with existing knowledge, native names are spelt in accordance with the following system, which has been adopted by the principal authorities in Great Britain and by the United States, and has been for some years in process of gradual introduction into all Admiralty Sailing Directions and Charts.

No change is made in the orthography of foreign names in countries which use Roman letters; thus French, Spanish, Portuguese, Dutch, &c., names will be spelt as by the respective nations.

1. Where native names have been so long written in a form which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation of the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English; *every letter being pronounced*. Two accents only are used:—

- (1.) The acute, to denote the syllable on which stress is laid. The use of this is very important, as the sounds of many names are entirely altered by the misplacement of this "stress."
- (2.) The sign  $\sim$  over the letter U to denote the short sound of that vowel under certain circumstances. (See table.)

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*.

The amplification of the rules is given on the following pages.

Information is invited as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system.

Letters.	Pronunciation and Remarks.	Examples.
a	ah, a as in <i>father</i> - - - -	Java, Banána, Somáli, Bari.
e	eh, e as in <i>benefit</i> ; a as in <i>fate</i> - -	Tal-el-Kebir, Oléleh, Yezo, Levúka, Peru.
i	English <i>e</i> ; <i>i</i> as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not <i>Feejee</i> , but	Fiji, Hindi.
o	o as in <i>mote</i> - - - -	Tokyo.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but	Zulu, Sumatra.
	The shorter sound of the different vowels, when necessary to be indicated, can be expressed by doubling the consonant that follows. The sounds referred to are as follows:— The short <i>a</i> as in <i>fatter</i> , as compared with the long <i>a</i> as in <i>father</i> . The short <i>e</i> as in <i>better</i> , as compared with the long <i>e</i> as in <i>fate</i> . The short <i>i</i> as in <i>sinner</i> , as compared with the long <i>i</i> as in <i>ravine</i> . The short <i>o</i> as in <i>sobbing</i> , as compared with the long <i>o</i> as in <i>sober</i> . The short <i>u</i> as in <i>rubber</i> , as compared with the long <i>u</i> as in <i>rubric</i> .	Yarra, Tanna, Mecca, Jidda, Bonny.*
ũ	is the same short sound of <i>u</i> as is denoted by doubling the consonant following, but is used, and only used, where such doubling is impossible, as in case of words where <i>u</i> is followed by two different consonants, as in <i>Tüng</i> , pronounced as the English <i>tongue</i> .  Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa, Oosima.
ai	English <i>i</i> as in <i>ice</i> - - - -	Shanghai.
au	ow as in <i>how</i> . Thus, not <i>Foochow</i> , but	Fuchau.
ao	is slightly different from: <i>au</i> - - - -	Macao.
aw	when followed by a consonant or at the end of a word, as in <i>law</i> - - - thus	Cawnpore.

\* The *y* is retained as a terminal in this word under rule 1. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> , or <i>ei</i> in <i>eight</i> .	Beirút, Beilul.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celébes</i> were not already recognised it would be written <i>Selébes</i> .	Celébes.
ch	is always soft as in <i>church</i> - - -	Chingchin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>Ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but	Haifong, Nafa.
g	is always hard. (Soft <i>g</i> is given by <i>j</i> ) -	Galápagos.
h	is always pronounced when used.	
hw	as in <i>what</i> ; better rendered by <i>hw</i> than <i>wh</i> , or <i>h</i> followed by a vowel. Thus, <i>Hwang ho</i> , not <i>Whang ho</i> , or <i>Hoang ho</i> .	Hwang ho, Ngan hwei.
j	English <i>j</i> . <i>Dj</i> should never be put for this sound.	Japan, Jinchuen.
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but	Korea.
kh	The Oriental guttural - - -	Khan.
gh	is another guttural, as in the Turkish -	Dagh, Ghazi.
l	} As in English.	
m		
n		
ng	has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	
p	As in English.	
ph	As in <i>loophole</i> - - -	Mokpho, Chemulpho.
th	Stands both for its sound in <i>thing</i> , and as in <i>this</i> . The former is most common -	Bethlehem.
q	should never be employed; the sound of <i>qu</i> in <i>quiver</i> is given as <i>kw</i> . When <i>qu</i> has the sound of <i>k</i> , as in <i>quoit</i> , it should be given by <i>k</i> .	Kwangtung.



Letters.	Pronunciation and Remarks.	Examples.
r	As in English.	
s	As in <i>sin</i> .	
sh	} As in English. - - - - -	Sawákin.
t		
v		
w		
x		
y	is always a consonant, as in <i>yard</i> , and therefore should never be used as a terminal, <i>i</i> or <i>e</i> being substituted. Thus, not <i>Mikindány</i> or <i>Wady</i> , but not <i>Kwaly</i> , but	Kikūyu.  Mikindáni, Wadi. Kwale. Zulu.
z	English <i>z</i> - - - - -	
zh	French <i>j</i> , or as <i>s</i> in <i>treasure</i> - - - - - Accents should not generally be used, but where there is a very decided emphatic syllable or stress which affects the sound of the word, it should be marked by an <i>acute</i> accent.	Muzhdaha.  Tongatábu, Galápagos, Paláwan, Saráwak.

In the case of native names in countries under the dominion of other European powers, in whose maps, charts, &c., the spelling is given according to the system adopted by that power, such orthography is, as a rule, disregarded, and the names are spelt according to the British system. Thus the island east of Java in possession of the Dutch is spelt *Madoera* by them, but on Admiralty charts *Madura*. A town in Java appears on Dutch charts as *Tjilatjap*; in the British, *Chilachap*.

When a foreign language is written in a vocabulary of fixed sounds, so as to permit of transliteration into the British system, a table of equivalents for each letter is drawn up, and names of places can be transliterated without regard to pronunciation.

It is rare, however, that any language is absolutely without variation in the sound of any letters or combination of letters. This system therefore requires care.

## A SHORT VOCABULARY OF POLYNESIAN DIALECTS.\*

ENGLISH.	MARQUESAS.	TAHITI.	HAWAII.	RAROTONGA.	MAHARIKI.	SAMOA.	NIUE.	FAKAOFO.	TONGA.	FUT (MAAT).	ROTUMAN.	ESQ.
Ant	Ko	Ho	Nomanona	Lo	Loa	Loi	Lo	Lo	Lo	Nekasikalo	Tutui	Long
Arm	Hina	Rima	Lima	Lima	Lima	U	Lima	Lima	Nima	Lingua	Siu	Pe
Arrow	Koniu	Ohe	Pupupana	...	...	...	Fana	...	Kaho	Nrasan	Fana	...
Bad	Pe	Ino	Ino	Kino	Kino	Leunga	Kela	Leunga	Kori	Tha	Kahia	Enana
Banana	Meka	Med'a	Mala	Meka	...	Pa'i	Puti	...	Hopa	Vundi	Per	Kaherong
Black	Pana	Eneere	Uluhi	Uluhi	Uluhi	Uluhi	Menauhi	...	Uluhi	London	Kel	Mite
Body	Tino	Tino	Kino	Kopopa	Tino	Tino	Tino	Uluhi	Jino	Vaunga	Tuoro	Kereman
Boy	Mahai	Tama tti	Kela kine	Tama tti	Tama tti	Tama	Tama	Tama	Tama	Nome tangana	Les illi	Ladre
Bow	Pana	Pana	Kakaka	...	...	Aufana	Kaufana	...	Kaufana	Takai	Loloki	...
Bread-fruit	Med	Uru	Aerel	Kulu	...	Ulu	Me	...	Med	U'o	U	Me
Breast	...	Hiti te aho	Hanu	A'o	Manava	Manava	Manava	Manava	Manava	Thangu	Huang	Menono
Brother	Tuanaa	Tuane	Honohanu Kane	Telua	Telua	Uso	Mata Keinaua	Telua	U'o	Tuakana	Sodini	Ie
Canoe	Vaka	Vaa	Kau	Vaka	Vaka	Va'a	Vaka	Vaka	Vaka	Waka	Tafang	Wa
Chief	Hakaki	Baaita	Alii	Araki	Araki	Alii	Iki	Alii	Eiki	Turanga	Nengata	Troth
Club	Akai toa	Raua	Nenu	Lupo	Tuki	Ustongi	Lakau	...	Akan	Nakau	Oipelong	...
Cloud	Ao	Ata	Ao	Ao	Ao	Ao	Aho	Ao	Akan	Desitangi	Aonga	Uchu
Cocos-nut	Eehi	Harii	Nin	Niu	Ni	Niu	Nin	Niu	Niu	Niu	Niu	Naine
Cold	Anu	Maarii	Anu	Anu	Makarii	Ma'alli	Makalii	Ma'alli	Mokolia	Matit	Matit	Ebeow
Come	Amal	Haeve mal	Hefe mal	Tue	Haeve mal	Sau	Hau	Sau	Hau	Lako mai	Leun	Ethok
Darkness	Potana	Potri	Poelele	Pouri	Pouri	Pouri	Pouri	Pouri	Fakapouri	Bu tuputo	Mahaen	Mpane
Day	Ao	Ao	Laokan	La	Ao	Ao	Aho	Ao	Aho	Singa	Terupile	Rau
Daughter	Mo'i	Tama hine	Kaikama hine	Tama ine	Tama ite va.	Afaine	Tama fine	Afaine	Oofine	Naluvalewa	Ata le'ehaina	...
Die	Mate	Pohe	Mate	Mate	Mine	Oti	Mate	Mate	Mate	Mate	Akia	Enuth
Distant	Mamao	Testea e	Loihiaku	Mamao	Mamao	Mamao	Mamao	Mamao	Mamao	Yawa	Souon pao	Etho
Dog	Nube	Uri	Ilo	Wango	...	Uri	...	...	Kuri	Kori	Kam bir	Miga

\* G. Turner LL.D., London Missionary Society, 1884.

A SHORT VOCABULARY OF POLYNESIAN DIALECTS—continued.

ENGLISH.	MARQUESES.	TABITI.	HAWAII.	BAROTONGA.	MANAREI.	SAMOA.	NIUE.	PAKAOU.	TONGA.	FOU (MAU).	HOUMAR.	KROU.
Drink	Inu	Inu	Inu	Inu	Inu	Inu	Inu	Inu	Inu	Ngumu	lom	Rark
Ear	Ilunina	Te lita o te ra	Pepei ao	Taruga	Taruga	Taruga	Taruga	Taruga	Taruga	Ndalingana	Falinga	...
East	Kal	Amu	Hikina	Kal	Kal	Sume	Kal	Kal	...	Thake	...	Hear
Eat	Kal	Amu	Hikina	Kal	Kal	'Al	Kal	Kal	...	Kauu	Ale	Mungar
Eye	Mata	Mata	Mata	Mata	Mata	Mata	Mata	Mata	Mata	Mata	Math	Mech
Father	Metua	Metua tane	Makua kane	Metua tane	Metua tane	Tama	Mata	Tama	Tama	Tamana	Oha	Chan
Four	Metu'u	Metu'u	Makua	Makua	Makua	Fefe	Makua	Makua	Maavaho	Bere	Fen	Inechuk
Female	Vahine	Ufa	Wahine	Vahine	Vahine	Fefine	Ffine	Ffine	Ffine	Nalewa	Ilolen	Kurra
Fire	Ahi	Auhi	Ahi	Ahi	Ahi	Ai	Ai	Ai	Ai	Iukawanga	Reh	Kajek
Fish	Ika	Ika	Lawia	Ika	Ika	I'a	Ika	Ika	Ika	Ika	I'e	Iak
Fowl	Mon	Mon	Manu	Mon	Mon	Mon	Mon	Mon	Mon	Tou	Mon	Wagun
Girl	P'hoie	Tama hine	Kaikama hine	Tama hine	Tama hine	Tine	Tama fine	Tine	Tu'ahine	Ngonelewa	Lehaina	Lidrik
Give	Valei	Hopoi	Ilawa	Kare	Kare	Fon'i	Fonki	Fonki	Fonki	Solia	Naf	Leihok
Go	He'e	Hele	Hele	Aere	Hano	Alu	Fono	Alu	Alu	Lako	La'o	Kio
Good	Meiaf	Meiaf	Meiaf	Meiaf	Meiaf	Lelei	Meiaf	Lelei	Lelei	Vinaka	Lele	Enimon
Great	Nui	Rahi	Nui	Mata	Rahi	Tele	Lahi	Tele	Lahi	Levu	Tiu	Ellap
Hair	Ouhio	Roulu	Laubio	Laulu	Laulu	Laulu	Laulu	Laulu	Laulu	Sitruunuluna	Gwal	Gwal
Head	Upoko	Upoo	Po'o	Mimiti	Ulu	Ulu	Ulu	Ulu	Ulu	Ndina	Filos	Bor
Heart	Ilakono	Fa'ar'o	Lobe	Akalongo	Langona	Fa'alongo	Fanongongong	Fakalongo	Fanongo	Rongedua	Thailung	Rong
Heat	Von	Mahashana	Uha	Me'sina	Vereha	Vereha	Mafana	Vereha	Mafana	Katakata	Pumahan	Ehnil
Heaven	Ani	Ra'i	Lani	Langi	Langi	Langi	Langi	Langi	Langi	Langi	Lang	Nalong
House	Fae	Fare	Ilale	Am	Fare	Fale	Fale	Fale	Fale	Vale	Ri	Im
Know	Ite	Ite	Kite	Egna	Itea	Itea	Itea	Itea	Itea	Kila	Mi atama	Tella
Land	Fenua	Fenua	Ilona	Egna	Itea	Fenua	Fenua	Fenua	Fenua	Vanua	Hania	Eni
Laugh	Ata	Ata	Akaka	Kata	Kata	Akaka	Kata	Kata	Kata	Dreidre	Kaha	Thing
Leg	Vae	Avae	Wawae	Vae	Vae	Vae	Hu	Vae	Vae	Yavana	La	Yavana

	Maama	Marumarama	Malamalama	Ao	Malamalama	Ula	Mama	Ao	Mama	Ula	Mama	Barama	Tafa	Merani
Light	Uia	Uia	Uia	Uia	Uia	Uia	Uia	Uia	Uia	Uia	Uia	Lira Iva	Mere	Iuca
Lightning	Foboe	Oia	Oia	Oia	Oia	Oia	Oia	Oia	Oia	Oia	Oia	Sa bula	Mauri	Mur
Live	Pepena	Hani	Hane	Angnan	Angnan	Fai	Eke	Fai	Eke	Mou	Mou	Thakava	Re	Checheke
Male	Abana	Oni	Kane	Tane	Tane	Tane	Tane	Tane	Tane	Tane	Tane	Tangane	Tha	Man
Man	Enata	Tane	Kamaka	Tangata	Tangata	Tangata	Tangata	Tangata	Tangata	Tangata	Tangata	Tamata	Tha	Man
Moon	Mahina	Avi'e	Mahina	Mahina	Mahina	Mahina	Mahina	Mahina	Mahina	Mahina	Mahina	Vula	Hual	Ateng
Mouth	Fafa	Vaha	Nuku	Ngutu	Ngutu	Ngutu	Ngutu	Ngutu	Ngutu	Ngutu	Ngutu	Ngutuna	Nuts	...
Mountain	Mauna	Mau'a	Kuabini	Maunga	Maunga	Maunga	Maunga	Maunga	Maunga	Maunga	Maunga	Uluivavua	Solo	Tol
New	Hou	Opl	Hou	On	On	Fou	Fou	Fou	Fou	Fou	Fou	Vou	F'o'on	Ekali
Night	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Po	Bongl	Pong	Bung
North	...	Apato'a	Akan	...	...	...	...	...	...	...	...	Vua liku	...	Euang
Nose	Ihu	Ihu	Uatangi	Ihu	Ihu	Ihu	Ihu	Ihu	Ihu	Ihu	Ihu	Uchuna	Is	Bohir
Old	Kakiu	Tabito	Kabiko	Hamiriatu	Tabito	Tabito	Tabito	Tabito	Tabito	Tabito	Tabito	Mendre	Mathua	Emor
Place	Tu'u	Tu'u	Kau Iho	Tuku	Tuku	Tuku	Tuku	Tuku	Tuku	Tuku	Tuku	Viria	Nasua	Likete
Pig	Puaka	Pu'a	Puaka	Puaka	Puaka	Puaka	Puaka	Puaka	Puaka	Puaka	Puaka	Puaka	Puak	Disg
Rat	Kioe	Iore	Iole	Kiore	Kiore	Kiore	Kiore	Kiore	Kiore	Kiore	Kiore	Kiava	Pitua	Oljerik
Rain	Ua	Ua	Ua	Ua	Ua	Ua	Ua	Ua	Ua	Ua	Ua	Utha	Uas	Noot
Red	Vekiki	Uraura	Ulaula	Malamala	Malamala	Malamala	Malamala	Malamala	Malamala	Malamala	Malamala	Damadamu	Mia	Mir
Sand	Onetai	One	One	One	One	One	One	One	One	One	One	Nukunuku	Thantthan	Bok
Ship	Ihepe	Pahi	U'a'a	Pahi	Pahi	Pahi	Pahi	Pahi	Pahi	Pahi	Pahi	Wanka levu	Abol	Kuando
Sit	Noho	Noho	Noho	Noho	Noho	Noho	Noho	Noho	Noho	Noho	Noho	Tiko	Nohe	Cherchet
See	Tiohi	Ite	Naka	Ataka	Ataka	Ataka	Ataka	Ataka	Ataka	Ataka	Ataka	Itathia	Loete	Loe
Son	Tama	Tama Ili	Kelle kase	Tama	Tama	Tama	Tama	Tama	Tama	Tama	Tama	Naturena	Le'a	Archere
South	...	Apato'erau	Kukulu bema	...	...	...	...	...	...	...	...	Thava	...	Buk
Spear	Pakeo	Mahae	Ihe	Tao	Tao	Tao	Tao	Tao	Tao	Tao	Tao	Moto	Tao	Marre
Stone	Kea	O'ai	Pohaku	Toka	Toka	Toka	Toka	Toka	Toka	Toka	Toka	Vatu	Hoik	Ejman
Star	Fetu	Feti'a	Hoku	Etu	Etu	Fetu	Fetu	Fetu	Fetu	Fetu	Fetu	Kabakalo	Heth	Uchu
Sea	Tai	Miti	Kai	Tai	Tai	Tai	Tai	Tai	Tai	Tai	Tai	Waitui	Sas	Langtha
Sun	Oumati	Ba	La	La	La	La	La	La	La	La	La	Singa	Asth	Al
Sugar cane	To	To	Ko	To	To	To	To	To	To	To	To	Novu	Thou	...
Small	Iti	Iti	Unuku	Ngiti	Iti	Iti	Iti	Iti	Iti	Iti	Iti	Lalal	Me'a	Errek

## A SHORT VOCABULARY OF POLYNESIAN DIALECTS—continued.

ENGLISH.	MARQUESAS.	TAHITI.	HAWAII.	KAROTONGA.	MANAHIKI.	SAMOA.	NUU.	FAKAOFO.	TONGA.	FJI (FUTU).	ROTUMAN.	ENOS
Taro	Tao	Taro	Kilo	Taro	Niho	Talo	Talo	Talo	Taro	Nalo	Au	"
Teeth	Niho	Niho	Niho	Ni'o	Niho	Nifo	Nifo	Nifo	Nifo	Batua	Al	Ngi
They	Aloa	Batoa	Lakou	Lakou	Lakou	Lakou	Lakou	Lakou	Nautola	Ko ira	Iria	"
Think	Metao	Mano'o	Manao	Ma'ra	Maharaha	Manatu	Manamanatu	Manatu	Manatu	Nanua	Aahai	Lemage
Thunder	Fatuhi	Patiri	Hohi	Manguangu	Patitiri	Fatitiri	Pake le langi	Fatitiri	Fatitiri	Kurukuru	Tuu	Tres
Tongue	Eso	Atero	Alelo	Alelo	Alelo	Alelo	Alelo	Alelo	Elelo	Iamena	Alei	Lor
Tree	Akau	Brau	Loua	Bakau	Lakau	Le'au	Lakau	Lakau	Akau	Nakau	Ol	"
Water	Vai	Vai	Uai	Vai	Vai	Vai	Vai	Vai	Vai	Wai	Voi	Dren
West	"	Te hitia o tera	Komohana	"	"	Sifo	Mahifalifo	"	Hikifo	Ra	"	Kabelung
Weep	Ese	Ta i	Ve	Aue	Tangi	Tangi	Tangi	Tangi	Hikifo	Tangi	Ou	Chung
White	Masita	Uoso	Aliali	Tetona	Tes	Shinaia	Hina	Shinaia	Hinehina	Shiga Singau	Fia	Mate
Wind	Matani	Mate'i	Makani	Matangi	Matangi	Matangi	Matangi	Matangi	Matangi	Thangi	Lang	Kutow
Yam	Bunahi	Uhi	Uhi	Ui	"	Ua	Ua	"	Ua	Uvi	Uk	"
One	Tahi	Tahi	Kahi	Te'i	Tahi	Tahi	Tahi	Tahi	Tahi	Ndua	Ta	Iurun
Two	Ua	Bua	Alua	Bua	Lua	Lua	Uo	Lua	Ua	Bua	Baa	Drad
Three	Tou	Toru	Alolo	Toru	Toru	Tolu	Tolu	Tolu	Tolu	Tolu	Thol	Chilu
Four	Fa	Ha	Aha	A	Fa	Fa	Fa	Fa	Fa	Va	Hak	Enser
Five	Iua	Elua	Alina	Rina	Lina	Lina	Lina	Lina	Nina	Lina	Liam	Lallen
Six	Ono	Ono	Eono	Ono	Ono	Ono	Ono	Ono	Ono	Ono	On	Chichina
Seven	Fitu	Hitu	Ahiku	Itu	Hitu	Fitu	Fitu	Fitu	Fitu	Vitu	Hith	Chichina
Eight	Vau	Vau	Anala	Vau	Vau	Vau	Vau	Vau	Vau	Vau	Voi	Twallhuk
Nine	Iva	Iva	Alva	Iva	Iva	Iva	Iva	Iva	Hiva	Thiva	Sior	Tualine jawon
Ten	Onohu'a	Ahuru	Unu	Neula	Laungahulu	Sefulu	Hongohulu	Sefulu	Hongofulu	Tini	Sanghal	Iungou
Twenty	Eua onohua	Te'au	Iwakua	Elua ugaun	Takau	Loufulu	Ua hongofulu	Loufulu	Loufulu	Ruanavulu	"	"
Hundred	An	Rau	Unuimi	Lau	Lima lakau	Sela	Te au	Sela	Te au	Duanadrau	Talan	Itaka
Thousand	Mano	Mano	"	Mano	Ua lau	Afe	Afe	Afe	Afe	Undulu	Afe	"



**IN THIS WORK THE BEARINGS ARE ALL MAGNETIC, EXCEPT  
WHERE MARKED AS TRUE.**

**THE DISTANCES ARE EXPRESSED IN SEA MILES OF  
60 TO A DEGREE OF LATITUDE.**

**A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO  
100 FATHOMS.**

**THE BEARINGS OF SECTORS OF LIGHTS ARE GIVEN  
FROM SEAWARD OR TOWARDS THE LIGHT.**

**THE SOUNDINGS ARE REDUCED TO THE DEPTHS OF LOW  
WATER OF ORDINARY SPRING TIDES.**

# INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

## ON THE CORRECTION OF CHARTS, LIGHT LISTS, AND SAILING DIRECTIONS.

There are three descriptions of publications as guides to navigation—the charts, the sailing directions, and the light lists—which are all affected by the continual changes and alterations that take place.

Of these the charts should always be, so far as our knowledge permits, absolutely correct to date; and the light lists should be noted for the recent alterations, though space will not permit of full details being always inserted. The sailing directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the charts must be taken as the guide.*

1. *Charts.*—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Office they are, as a rule, fresh from the plates. They then receive such corrections by hand in the dépôts as are required, and are so issued to the ships.

All small but important corrections that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer.

Large corrections that cannot conveniently be thus made are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.



The dates on which these large corrections are made are noted on the chart plates in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners.

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (which will be found in the lower right-hand corner), in order that at the Admiralty it may be known what edition of the chart is referred to.

2. *The Light Lists*, annually published at the beginning of each year, are not corrected in the depôts before issue, but appendices are issued every two months, giving the alterations that have taken place, copies of which are put into the chart boxes.

It is the duty of the navigating officer when he receives the set of charts to make notations in the light lists from these appendices, and from the Notices to Mariners in the box; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the descriptions in the Sailing Directions may be obsolete, in consequence of changes made since publication.

3. *The Sailing Directions* are not corrected before issue, except occasionally for very important new rocks or dangers. Hydrographic Notices and Supplements referring to each volume are published from time to time.

Supplements contain all the information received up to date since the publication of the volume to which they refer, and cancel all previous Hydrographic Notices.

Hydrographic Notices contain all information up to date since the publication of the volume, or since the last Supplement or Hydrographic Notice, but endeavour is made to issue no more than one of these affecting each volume, and, on the collection of fresh information, to include the former Notice in a Supplement.

The existence of Supplements or Hydrographic Notices is to be noted, in the tabulated form placed for the purpose inside the cover of each volume, in cases when such notations have not been made before issue, and also on receipt of further Notices after commission.

Notes should be made in the margin of the volume of sailing directions affected, as references to the Supplements or Hydrographic Notices when the latter are printed on both sides.

To enable the books to be more conveniently corrected, however, such Supplements and Hydrographic Notices as are of moderate size are now being printed on one side only, and two copies are issued to each ship; one to cut up, the slips being pasted in at the appropriate place; the other to remain intact for reference.

To make these notations or paste in these slips is one of the early duties of a navigating officer after drawing his box of charts and books, and similar notes are to be made from Notices to Mariners that may thereafter be received.

It must, however, be thoroughly understood that sailing directions will never be correct in all details, except up to the date of the last Hydrographic Notice or Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide; for which purpose, for ordinary navigation, they are sufficient.

---

## THE USE OF CHARTS AS NAVIGATIONAL AIDS, AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

**1. Accuracy of a Chart.**—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that precluded great accuracy of detail, and until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fulness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, **and this rule should be invariably followed, viz., that instead of considering a coast to be clear unless it is shown to be foul, the contrary should be assumed.**

**2. Fathom Lines a Caution.**—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

**3. Chart on largest scale always to be used.**—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coast-line or soundings. This is an additional reason, besides the obvious one of the greater detail shown on a larger scale chart, why this largest scale chart should always be used for navigating.

**4. Caution in using small Scale Charts.**—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

**5. Distortion of Printed Charts.**—The paper on which charts are printed has to be damped. On drying distortion takes place, from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines to objects be long. The larger the chart the greater the amount of this distortion.

**6. Buoys.**—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

**Gas Buoys.**—The lights shown by gas buoys cannot be implicitly relied on, as if occulting the apparatus may get out of order, or the light may be altogether extinguished.

**7. Lights.**—Circles drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show equally in all directions, the bearings between which the variation, or visibility, or obscuration of the light occurs.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height at end of each Light List, affords a means of ascertaining how much more or less

the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles, if of any power. (*See table in Light List above mentioned.*)

**8. Fog Signals.**—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the origin of a sound, even in clear weather. Therefore too much confidence should not be felt in hearing a fog signal. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a lighthouse until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be sounded. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

**9. Tides and Tidal Streams.**—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, the table (B) at page 98 of the Tide Tables will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs on the coasts of Europe at the equinoxes, but wind may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

**10. Current Arrows** on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

**11. Fixing Position.**—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are now being supplied with a station pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and second, that the observer is skilful and rapid in his use of the sextant.

For the former, reference can be had to the pamphlet on the use of the station pointer, which is in every chart box.

The latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or rifle-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed.

In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, as fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow, and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, gives an excellent fix for a departure, but does not ensure safety, as the point, and probably the rocks off it, are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is now supplied in all chart boxes.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, *i.e.*, should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

In ships still fitted with the Admiralty standard compass, the tripod supplied to hold the lamp will be found of great service in fixing position at night, as by its aid a bearing can be as accurately taken as in daylight. With Thomson's compass bearings can also be accurately observed at night. The utility of this in connection with ascertaining the change of bearing of an approaching ship's light should not be forgotten.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude and longitude by chronometer) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line provided the chronometer is correct. A deep cast at the same time may often serve to get an approximate position on the line. An early and very accurate position can be also obtained by Sumner's method, by getting longitude by a bright star at daylight when the horizon is well visible, and another longitude by the sun when a few degrees above the horizon, or by observing two or more stars at twilight. The Sumner lines drawn through the two positions thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

**12. *Change of Variation of the Compass.***—The gradual change in the variation must not be forgotten in laying down positions by bearing on



charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are long, the displacement of position from neglect of this change, may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations too often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes  $10^\circ$  in less than 500 miles. The variation chart should be consulted on this head.

**13. Local Magnetic Disturbance of the Compass on board Ship.**—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases, that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

The law which has hitherto been found to hold good as regards local magnetic disturbance is, that north of the magnetic equator the north end of the compass needle is attracted towards any centre of disturbance; south of the magnetic equator it is repelled.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

**14. Use of Oil for Modifying the Effect of Breaking Waves.**—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows :—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain; as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.
4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.
5. It is useful in a ship or boat, both when running, or lying to, or in wearing.
6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.
7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.
8. The best method of application in a ship at sea appears to be: hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

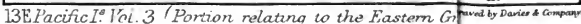
9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

---







# PACIFIC ISLANDS.

---

VOL. III.

---

## EASTERN GROUPS.

---

### CHAPTER I.

GENERAL INFORMATION — CORAL REEFS AND ISLAND GROUPS — WIND AND WEATHER — TEMPERATURE — DEPTHS — CURRENTS — VIGIA — COAL — BUOYAGE — REPAIRS — ABORIGINES — COMMUNICATIONS — PASSAGES — TRADE WIND TABLE.

**INTRODUCTORY REMARKS.**—The sailing directions for the island groups of the Pacific Ocean are published in three volumes. Volume 1 treats of the groups on the western side of the Pacific, and includes a part of New Guinea; the Solomon islands; New Britain, New Ireland and the Admiralty island groups; the Caroline islands; and the Mariana or Ladrone islands.

Volume 2 contains a description of the central groups, such as New Caledonia; New Hebrides; Loyalty islands; Fiji group; Tonga islands; Samoa islands; Ellice, Gilbert and Marshall groups; and the Phoenix islands, &c.

Volume 3 describes the Eastern groups, viz., the Sandwich islands; the Marquesas; Cook and Society groups; the Low Archipelago and numerous solitary islands.

The Eastern shore of the Pacific is described in the volumes relating to the Western shore of America, and the Western shore of the Pacific in the Australian and China pilots.

New Zealand and the adjacent groups has a separate volume.

**GENERAL REMARKS.\***—The probable existence of an ocean westward of America was soon suspected by the Spanish discoverers and conquerors of the New World, but it first became known to them as an established fact on September 25th, 1513. Columbus had, in 1502, explored the northern coast of South America as far as the Isthmus of

---

39 \* See Admiralty chart, No. 2,683, Pacific ocean; *d.* = 0.2 of an inch.

Darien, and had established various posts and garrisons. Eleven years later, Vasco Nuñez de Balboa, the governor of Darien, acting on native information, marched across the isthmus with a small force, of which the celebrated Francisco Pizarro was a member. It is related of Nuñez that on arriving at the foot of a hill, from the summit of which he was told that this unknown sea would become visible, he halted his men, ascended alone, and on the broad expanse of water opening to his astonished gaze, fell on his knees and thanked heaven for having bestowed on him the honour of being the first European to have this great ocean revealed to him.

Nuñez de Balboa, in entire ignorance of the vast extent of his discovery, named it the Mar del Zur, or South Sea, because it was so situate relatively to that portion of the coast from which he first saw it, and subsequently he took formal possession of it as such in the name of the King of Castile and Léon.

Fernando de Magalhaens, the great Portuguese navigator, was the first to cross this ocean, in the years 1520-1. He, acting under a commission from the Emperor, Charles V. of Spain and Germany, discovered and entered upon its waters by the straits of Magellan, named after him; having passed through which, he sailed northward, and crossing the ocean within or near the tropics in fine weather, he gave it the name of Pacific Ocean; which name, though scarcely more appropriate than South Sea, to the whole, or even to the larger portion of this vast body of water, is that by which it is now universally known.

For about two centuries after the discovery of the Pacific Ocean, such exploration as was carried on was mainly under Spanish auspices, and so little was known of it by the outside world, that so lately as Lord Anson's voyage round the world, 1761-4, California was represented as an island, and the whole American coast northward of it, as well as the area occupied by the Alentian Islands was a blank. On the western side of the ocean, the Philippine and some other islands occupied by Spain had long been known, as also some of the islands in mid-ocean passed by the galleons on their voyages between South America and the Philippines, but by far the greater number were unknown until the middle of the 18th century, when a great impulse was given to hydrographic enquiry, and the ablest seamen of many nations vied with each other in adding to the world's knowledge of these wide regions.

Of all navigators engaged in this work, perhaps the most celebrated was Captain James Cook, R.N., both on account of the extent and accuracy of his labours, and of his tragic end on February 14th, 1779. Byron, Wallis, and Carteret, who preceded Cook, and Vancouver who followed him, all did valuable service, and during the early part of the 19th century great



additions to hydrographic knowledge were made by such well-known men as Beechey, Belcher, Kellett, Fitz Roy, and others too numerous to mention; whilst of foreign officers, such distinguished men as Valdez, Krusenstern, Kotzebue, La Pérouse, D'Urville, Duperré, Wilkes, and others, did their full share of Pacific exploration. In more modern times, the work has progressed with largely improved means and appliances, but as the names of the officers and ships engaged in these more recent services will frequently recur in the body of this work, it is unnecessary to mention them here.

**CORAL ISLANDS AND REEFS.—Definitions.**—As the various forms of coral structure are best understood under well-defined names, a description of those principally in use is now given :—

**An Atoll** may comprise one or any greater number of coral islands of little height above the sea, situated on a strip or ring of coral surrounding a central lagoon. The Tuamotu group of islands are nearly all of this character.

Many of these Atolls have passages through the ring of coral reef of sufficient depth to admit the passage of ships to secure and sheltered anchorage in the enclosed lagoon; but in some, the passages merely admit boats, and in others the ring is without an opening.

**Atollon** is the name applied to a small atoll on the margin of a larger one.

**A Barrier reef** may front a coast-line, or encircle an island or group of islands, leaving a deep channel between it and the shore. The Great Barrier reef of Australia which trends for about 1,000 miles in a north-westerly direction, and varies from 12 to 140 miles from the Queensland coast, is an example of the former, and the Barrier reef surrounding Tahiti, the principal island of the Society group, is an example of the latter. Barrier reefs form natural breakwaters with passages through them into good harbours; these passages are generally opposite a valley in the land sheltered by the reef. Tidal streams and currents are generally strong and uncertain in these barrier openings; see page 16.

**A Fringing reef** is a coral reef extending from the shore, seldom for a long distance, having but little water on it, and no ship passage between it and the land. As the seaward face of these reefs is generally the highest part, the tide is more or less impounded on some of them, facilitating navigation by canoes or boats at low water in the narrow passages which generally exist. A coast-line with a fringing reef has frequently a barrier reef also with a deep passage between the two reefs.

**Navigation among Coral Reefs.**—As successful navigation through or amongst coral reefs is often dependent upon the eye, it is as well to name the conditions under which reefs are most easily to be seen:—thus, they are always more plainly to be seen from the masthead than from the deck or bridge, and when the sun is high rather than when it is low; as also with the sun behind the observer rather than facing it. If the sea is glassy calm it is extremely difficult to distinguish reefs.

The best conditions therefore are with the sun high and behind the observer and the sea ruffled by a pleasant breeze. Banks with about 3 feet water over them then appear of a light brownish colour; those with a fathom, or more, of a clear green deepening to a darker green as the water increases in depth, and finally to a deep blue when out of soundings.

Under favourable circumstances a bank with 3 or 4 fathoms over it can be seen from aloft at a good distance, but where, and in proportion, as the depths increase beyond this, the bottom will only be seen when nearly over it.

**PRINCIPAL ISLAND GROUPS.**—The Tuamotu or Low archipelago lying between the parallels of  $14^{\circ}$  and  $25^{\circ}$  S., and between the meridians of  $125^{\circ}$  and  $149^{\circ}$  W., consists of a mass of low coral islands to which there are only three exceptions, Henderson, Pitcairn, and the Gambier or Mangareva islands. Navigation among these islands is dangerous on account of the uncertain set of the currents, and the still imperfectly charted reefs and islands. However, there is but little inducement for vessels to visit these groups, as the only trade with the natives consists in the purchase of cocoa-nuts which grow on the islands and a little pearl-shell; the natives subsisting mainly on the fish they catch in the lagoons. The islands, excepting Ducie, Henderson, Pitcairn, and Oeno, are French.

**The Society islands**, which lie but a short distance westward of the Tuamotu group, present a very different appearance. They are high mountainous islands covered with luxuriant vegetation to the summits, and well cultivated in the plains and valleys, with numerous streams and cascades running down their sides into the sea.

This group is also in the possession of the French, who have their chief establishment at Papiet  in Tahiti island, a good harbour where supplies of all descriptions can be obtained, and small repairs to machinery effected.

**The Tubuai or Austral islands**, lying south-westward of the Tuamotu archipelago, form a group of five islands of but little importance, but the four larger are under French protection.

---

*See chart, No. 2,683.*

**The Cook islands** are under British protection; they lie about 180 miles W. by N. from the western end of the Tubuai group, and are ten in number; nearly all of them were discovered by Captain Cook. Most of the islands are high, and Rarotonga, the principal island, is the highest.

**The Marquesas islands**, to the northward of the Tuamotu archipelago, are also a French possession. They are high well-wooded islands with several good anchorages and harbours, the best of which is Tai-o-haé or Anna Maria bay in Nukuhiva or Marchand island, where the French establishment is situated.

These islands are but little cultivated, although the soil is good and well adapted to the growth of cotton, &c. Supplies, sufficient for the wants of vessels calling, may be obtained at the principal ports, and the natives are willing to trade.

**The Line islands** are scattered islands near the equator in the vicinity of the 160th westerly meridian; they are all low coral islands covered with a scanty vegetation and a few cocoa-nut trees. From some of these islands guano in large quantities has been exported, but the supply is now nearly exhausted; otherwise they are of but little value, only producing a small quantity of cocoa-nuts, &c.

**The Hawaiian or Sandwich islands** consist of eight high volcanic islands, of which the southern is still in a state of activity.

These islands were formally annexed to the United States by joint resolution of the two houses of Congress on the 7th July 1898. They afford several good anchorages, but the most important port is Honolulu in Oahu, the seat of the Government and the port of call for steamships running between America and China or Australia, and also the commercial centre of the group. There is a snug inner harbour here, formed by an opening in the reef. Supplies of all kinds are abundant, and the islands are well cultivated with sugar-cane, &c., which yields large quantities.

**WIND and WEATHER.\*—Barometer.**—The general wind system of the Pacific Ocean, or of any large area, can only be explained by the aid of a comprehensive knowledge of the barometric pressure prevailing, not only over the area in question, but, generally, over adjacent areas. Modern scientific inquiry, aided by telegraphic communication, has greatly and rapidly extended this sphere of knowledge.

Though certain meteorological facts are now thoroughly established and comparatively well known, it may be well to state shortly the laws governing the relation of wind to barometric or atmospheric pressure.

---

\* See wind charts of the world, Nos. 2,931 to 2,934.

Of these, the primary fact is, that where atmospheric pressure, from whatever cause, falls below its average, *i.e.*, where there is a deficiency of air, an impulse is given for an inflow of air from any adjacent locality where there exists an area of high pressure, or in other words where there is a surplus of air. The strength of the air current or wind caused by these conditions will naturally depend on whether the difference of pressure between centres of low and high pressure areas, as also their distances apart, are great or of but slight proportions; and the movement of the air current will not as a rule be directly towards the low-pressure centre, but with an in-moving rotary motion round it.

In North latitude, the spiral in-flowing movement of the air round areas of low pressure is always in the opposite direction to the motion of the hands of a watch placed face upwards, and in South latitude it is the exact reverse; in each case the motion is called cyclonic. Around areas of high pressure the air also circulates, but with an out-flowing tendency and always in the opposite direction in each hemisphere to the cyclonic motion; hence this motion is known as anticyclonic.

**North Pacific winds.**—Across nearly the whole of the North Pacific, from an average of  $5^{\circ}$  to  $25^{\circ}$  N. latitude, the North-east trade winds prevail, their force not equal to that of the North-east trades of the Atlantic, though sometimes very strong in the neighbourhood of the Sandwich islands, and their direction varying between North and East and sometimes even southward of East. The whole area of these trade winds has a lateral oscillatory movement, approaching nearest to the equator during the northern winter months and receding farthest from it in the northern summer; so that in January the southern mid-ocean limit is within  $5^{\circ}$  of the equator, whilst in July it is no nearer than about  $9^{\circ}$ . On the eastern side of the ocean the width of the trade wind area is at its greatest, and on the western side it has least force and gradually becomes merged in the monsoon system of the China seas. See table of monthly limits of trade wind in North Pacific, page 24.

Between the North-east and South-east trade winds, the latter to be presently described, there is found the usual belt of calms, variable winds, and occasional squalls, known to seamen as the doldrums, but in the Pacific this region is by no means so wide as in the Atlantic.

Between the Sandwich islands and California there is an area of constant high barometric pressure; consequently there is an anticyclonic air current around this district, with small variations caused by season modifications of the system.

From about lat.  $30^{\circ}$  N. to the northward, the whole distance across the Pacific from West to East until nearing the American coast, when the limit

---

See wind charts, Nos. 2,931 to 2,934.

becomes as high as lat.  $40^{\circ}$  N., the mean direction of the wind is about due West, inclining to the northward of West during summer and to the southward of West during the winter months. Within this area, as in the corresponding belt of the Atlantic, however, cyclonic gales and storms pass from West to East, causing great temporary interruptions to the general system. The actual wind experienced by a ship under these circumstances will depend upon whether the centre of depression passes northward or southward of her; if the former, she will have winds from some westerly quarter; if the latter, from an easterly quarter. As the more ordinary track of these cyclonic depressions appears to be along the line or northward of the Aleutian islands, it follows that vessels navigating the waters to the southward will generally be in that half of the depression where westerly winds prevail.

Between the westerly winds and the trade winds there is an intermediate space of about  $10^{\circ}$  of latitude where the wind has no settled direction. For the most part, this region lies between the parallels of  $20^{\circ}$  and  $30^{\circ}$  N. lat., but its position varies with the seasons; in the summer, the trade wind extending to the northward and the southern limit of the West winds receding before it, and vice versa in the winter. Within this space, as in the doldrums, winds from opposite directions, with sharp squalls and calms alternate, rendering navigation very difficult to sailing vessels, and clearly indicating to all such the wisdom of keeping northward of this region if bound eastward, and southward of it if bound westward.

It should be noticed, however, that this unsettled region does not extend across the Pacific from shore to shore, northerly winds prevailing on the American side for  $10^{\circ}$  or  $12^{\circ}$  of longitude from the coast, and on the western side, the prevalence of the monsoons is clearly marked as far northward as  $30^{\circ}$  N. lat., where they merge in the westerly wind region before described.

**U.S. Pilot charts.**—These charts are published monthly by the U.S. Hydrographic Office. The following is abridged from a monthly summary of weather forecasts for the North Pacific given on these charts:—

**From January to April** the general movement of the wind will be anticyclonic round the high-pressure system before mentioned, lying between California and the Sandwich islands. About the Aleutian islands is an area of low pressure, its axis just southward of and parallel with them. Between these areas of high and low pressure there will be a general movement of the air from Asia towards America. Between lats.  $35^{\circ}$  and  $50^{\circ}$  N. frequent squalls and gales, with fog, rain, and snow may be expected. Over Asia there now exists an area of high pressure, and

the general direction of wind along that coast will be from the northward and eastward.

**In May**, marked changes of weather may be expected. The high-pressure system between the Sandwich islands and California spreads out more, extending chiefly to the northward, whilst the gradients of the low-pressure system over the Aleutian islands becoming less steep, the cyclonic circulation around it becomes weaker and the winds lighter. In the zone between lats.  $35^{\circ}$  and  $50^{\circ}$  N. a constant succession of moderate westerly gales may be expected accompanied by rain, and northward of lat.  $45^{\circ}$  N., by hail or snow. These gales, however, are less frequent than in the preceding month, but fog is very common. The high pressure area over Asia will now have disappeared, and the winds on that coast will be variable with a balance on the N.E. coast of northerly winds.

**June to August.**—The high-pressure area between California and the Sandwich islands will be larger than in the winter months, whilst the low-pressure system over the Aleutian islands will fill up, and in July and August will appear merely as an extension of the low-pressure system at this time prevailing over Asia. In the zone between lats.  $35^{\circ}$  and  $50^{\circ}$  N., gales with rain may be expected, but with less frequency. In the vicinity and southward of the Aleutian islands, the winds will be generally from the southward or westward, and from moderate to fresh in strength. Northward of lat.  $40^{\circ}$  N., for the whole width of the ocean, fog will be frequently met with.

**In September**, the high-pressure area between the Sandwich islands and California moves farther eastward, and is of smaller extent; the low pressure over the Aleutian islands becomes more marked; whilst a high-pressure system is forming over northern Asia, and the low pressure over south-eastern Asia is moving south-eastward off the coast. In the zone between  $35^{\circ}$  and  $50^{\circ}$  N. lat. gales with rain may be expected with increasing frequency, and northward of lat.  $45^{\circ}$  N. occasional fog may be expected.

**October to December.**—The high-pressure system between the Sandwich islands and California moves more to the southward and south-eastward, and in December its western side is elongated so as to extend nearly across the ocean. The Aleutian low-pressure system becomes well defined with steeper gradients. In the zone between lats.  $35^{\circ}$  N. and  $50^{\circ}$  N., gales with rain become more frequent. The high-pressure system over Asia becomes well established, and northerly and easterly winds will prevail on that coast. In October, occasional fog may be experienced northward of lat.  $45^{\circ}$  N.

In the northern hemisphere, a comparatively low-pressure zone lies just northward of the equator, and does not alter much either in position or pressure with the seasons, the average barometric reading in January being about 29·90 inches, and in July 29·95 inches. In the low-pressure belt of the Aleutian islands, the average reading in January is about 29·55, but in July when this low-pressure area has nearly filled up it is about 29·80 inches. In the high-pressure area between these two, of which the highest part is that so frequently alluded to as lying between the Sandwich islands and America, the average reading in January, in about lat. 30° N., long. 140° W. is 30·15 inches; and in July, in lat. 35° N., long. 150° W., 30·30 inches.

**SOUTH PACIFIC Winds.**—In the South Pacific, the conditions may generally be assumed, with some modifications, to be the counterpart of those in the North Pacific. The South-east trade is by no means so constant as the North-east trade; generally speaking, it may be said to include an area of about 28° of latitude in width, this area oscillating northward and southward according to the season as in the case of the North-east trade, but with its northern limit always northward of the equator, reaching, in fact, as far as 8° N. lat. in July and August, but only to about 3° N. lat. in January. It does not, however, blow across the whole width of the ocean with the regularity which might be expected, except, perhaps, during the months of July, August, and September. At other times there would appear to be great irregularity in the large central region occupied by the Tuamotu or Low archipelago, the Society islands, and their vicinity. Beyond this region, but within an area of restricted width, they appear generally to blow home to the south-eastern Australian mainland shore. See table showing monthly limits of trade wind in South Pacific, page 25.

Southward of the trade winds is a belt, corresponding to that in the northern hemisphere, where very variable winds prevail, chiefly from the northward and north-westward on the western side of the ocean, and from the south-westward and southward near the South American coast. This area gradually merges in higher southern latitudes into the region where westerly winds prevail.

A constant high-pressure barometric system corresponding with that already described in the North Pacific, appears to exist in the South Pacific ocean between the parallels of 15° and 40° S. lat., and between the meridians of about 80° and 140° W. long. The winds, as described, will be found to be in conformity with the rule previously mentioned as regards anticyclonic motion in South latitude, but it should be remembered that the whole high-pressure area moves somewhat more to the southward

during the southern summer, and to the northward during the southern winter, than its mean position during spring and autumn. In high southern latitudes there is, as in the North, a permanent low-pressure system.

**Winds over groups and islands.**—Most of the groups and islands described in this work lie within the limits of the trade winds, but some general remarks as to the local winds over and amongst these groups, especially in the large central region of irregularity before referred to, are here annexed.

At Easter island, in lat.  $27^{\circ} 10'$  S., long.  $109^{\circ} 16'$  W., the S.E. trade blows steadily from October to April, but in the winter months (May to September) when the trade has receded to the northward, westerly winds prevail and there is much rain.

In the vicinity of Pitcairn island, at the south-eastern end of the Tuamotu archipelago, there is no regular trade, but in summer the wind is generally between E.S.E. and North, and in winter between E.S.E. and S.W.

At Rapa island, which is just outside the limits of the S.E. trade, the wind is generally from the eastward from October to April, with occasional westerly breezes, especially from December to February. From May to September the prevailing wind is from the westward, with heavy gusts and much rain.

As before mentioned, the trade wind among the Tuamotu archipelago is very unsteady both in strength and direction, especially from November to March when heavy squalls from the westward and north-westward are often experienced. This is the season of the north-west monsoon.

Among the Society islands the S.E. trade blows steadily from April to December, but during the remainder of the year westerly winds are frequently experienced.

Even in the vicinity of the Marquesas group, which should be from its position in the very heart of the trade, the S.E. wind is by no means as constant as in the Atlantic ocean, though the wind is nearly always from the eastward, only occasionally getting westward of North, when it may be expected to turn to a gale. From April to October, the wind is generally S.E.; whereas, from October to April, it is usually from E.N.E.

Near the equator, in the vicinity of Christmas and Fanning islands, the trade becomes an easterly wind which blows steadily during the greater part of the year. At Fanning island, from January to March, the wind becomes uncertain as the S.E. trade recedes to the southward, and sometimes strong northerly winds are experienced with much rain.

The Hawaiian or Sandwich islands in about  $20^{\circ}$  N. experience the N.E. trade during the greater part of the year, sometimes with the force of a



moderate gale ; but in the winter months it is not unfrequently interrupted by southerly and south-westerly gales which sometimes blow for several days in succession.

**HURRICANES, &c.**—Little is known of the origin of cyclonic storms either in the North or South Pacific, but there can be no doubt that they have their birth in equatorial regions, owe it to the same causes as in the Atlantic or India Ocean, are preceded and accompanied by the same barometric indications, and follow very similar courses, travelling westward and diverging at first gradually from a W.N.W. or W.S.W. direction according as their path lies northward or southward of the equator, to a more northerly or southerly course, and at last curving away north-eastward and eastward or south-eastward and eastward, until finally exhausted or absorbed in other wind systems.

**In the South Pacific**, the hot months, December to March inclusive, are those in which cyclonic storms may be expected ; in November and April they are occasionally experienced, but in the remaining months of the year they are practically unknown. In the large area between the Tuamotu archipelago and America no cyclonic storm has been recorded ; amongst the islands of that archipelago they are very rare ; over the Society, Tubuai, and Cook islands they are more frequent ; and over the island groups westward of those named they are very common, scarcely a year passing without several of them traversing the area in which lie the Samoa, Fiji, and Tonga island groups, these groups lying in their main track as they curve away from equatorial regions south-westward, southward, and then south-eastward as before described. Many storms, however, make their curve to the southward still farther westward than this group area, and a few eastward of it.

In a short treatise, published in 1893, by E. Knipping, formerly director of the meteorological observatory at Tokyo, Japan, it is stated that of 125 cyclonic storms of which particulars had been obtained, the tracks of seventy-four passed through the Samoa, Fiji, and Tonga island group area, forty passed round westward of that area, and only eleven passed eastward of it. Though much more information on the subject is desirable, this in all probability represents very fairly the general tracks of these storms.

Though some of the cyclonic storms of the South Pacific are undoubtedly of full hurricane force, they, as a rule, do not appear to be so severe as those of the Atlantic and Indian Oceans or of the China seas.

**In the North Pacific**, the hurricane months are from July to October, and sometimes November. Cyclonic storms are then of somewhat frequent occurrence on the eastern side of the ocean, off the coasts of

---

See wind charts, Nos. 2,931 to 2,934.

Mexico and South California, rare in mid-ocean, but common on the western side where they are of hurricane force, and frequently pass over the Philippine and adjacent islands, or through the Formosa channel into the China sea, there taking the name of typhoons; but the centre of the average Pacific hurricane proper, from the vicinity of the Caroline or Ladrone islands, passes with a wide curve round eastward of, but bordering on the coasts of the Philippine islands and Formosa, on either side of or over Japan, from thence expanding and losing much of its force, close past the southern point of Kamchatka, and, nearly on the arc of a great circle, across Bering sea, northward of the Aleutian islands, across the Alaskan peninsula, and strikes the American coast between the parallels of  $48^{\circ}$  and  $58^{\circ}$  N. lat. Most of these storms have, by this time, exhausted their energy, but some have been known to cross the American continent and continue their course across the Atlantic.

In other months, *i.e.* from November or December to June, the average track of ordinary cyclonic gales across the North Pacific from West to East is much the same as in the hurricane months, and, as before noticed, the centres of depressions being generally northward of the Aleutian islands, vessels southward of those islands are almost certain of winds from a westerly quarter.

**TEMPERATURE.\***—The surface temperature of the Pacific in mid-ocean varies but little when within the tropics, from  $76^{\circ}$  to  $80^{\circ}$  being about the usual temperature, but rising  $2^{\circ}$  or  $3^{\circ}$ , as either side of the ocean is approached. Beyond the tropics, the isotherms, or lines of equal temperature, are nearly parallel with the equator, and oscillate southward and northward from  $10^{\circ}$  to  $15^{\circ}$  of latitude, according to the season, though the difference of temperature is greater in the North than in the South Pacific; thus, in February, the surface temperature in mid-ocean, in lat.  $45^{\circ}$  N. is about  $46^{\circ}$ , and in August  $64^{\circ}$ , a difference of  $18^{\circ}$ ; whereas in lat.  $45^{\circ}$  S., in February, the surface temperature is about  $60^{\circ}$ , and in August  $50^{\circ}$ ; a difference of only  $10^{\circ}$ .

The reports from the *Challenger* expedition show that the water rapidly cools from the surface downwards. Between the parallels of  $40^{\circ}$  N. and  $40^{\circ}$  S., the temperature at a depth of 1,500 fathoms is about the same,  $34^{\circ}$  or  $35^{\circ}$ . Below that depth the water is slightly colder in the South than in the North Pacific, doubtless owing to the slow bottom inflow of Antarctic water; whilst above that line the water is colder in the North Pacific. On the western side again the bottom water is colder than on the eastern side; this is attributable to the motion of the earth tending to divert the north-moving bottom current to the westward.

---

\* See Temperature charts, No. 2,930.

**DEPTHS.**—Soundings have not been conducted on a sufficiently large scale in the Pacific ocean for more than an idea to be formed of its bed as a whole, though lines of soundings with a view to the laying of telegraph cables have been run from San Francisco to the Hawaiian or Sandwich islands, and from thence across the ocean to the Bonin islands, southward of Japan, and again from the Hawaiian islands to Fiji, also from Vancouver to Australia. From these and other independent soundings, the general depths appear to be between 2,000 and 3,000 fathoms, but with some deep depressions, especially in the western half of the ocean, where, in the neighbourhood of the Kuril, Caroline, Tonga, and Kermedec islands, especially the latter, are some of the deepest known soundings in the world, varying from 4,000 to over 5,000 fathoms.

A direct line of soundings from Magellan strait to New Zealand, between lats.  $52^{\circ}$  and  $45^{\circ}$  S., also shows very even depths, but averaging some 300 or 400 fathoms less than in the North Pacific. Between the Sandwich islands and Tahiti, and southward of the latter as far as lat.  $40^{\circ}$  S., the bottom consists mostly of red clay, except around volcanic islands, where volcanic debris and ordinary mud prevails. In nearly all the soundings manganese is found. In other parts of the ocean, when the depth is over 2,000 fathoms, the bottom is generally of red clay, but in some cases of soft gray mud.

**CURRENTS.\***—The current system of the Pacific ocean bears a close resemblance to that of the Atlantic, and is easily understood, the currents following very much the course of the winds, but as regards both strength and direction, except on the lines of the most frequented trade routes, information is as yet somewhat scanty. The original movement of the surface water being apparently the drift caused by the action of the trade winds, it follows that, with one important exception, the great mass of water in the tropical regions is in motion westward; the configuration of the land, however, in the North Pacific gives a much greater degree of certainty as to its future direction and strength after it has curved away from its equatorial direction northward, on the western side of the ocean, than does that of the South Pacific, with its wide opening southward to the Antarctic regions.

**Equatorial current and Counter current.**—The westerly equatorial drift in the South Pacific, caused by the South-east trades, will generally be found to extend from about  $20^{\circ}$  or  $25^{\circ}$  S. lat. to and considerably northward of the equator, its farthest southern limit being towards the American side of the ocean. In the North Pacific, that caused by the North-east trades, extends towards the equator from about

---

\* See current charts of the Pacific ocean, Nos. 2,957 to 2,960.

25° N. lat. on the eastern side to 20° N. as the Asiatic islands are approached. Near the equatorial limits of these currents, which correspond closely with the region of the doldrums, the set is almost due West (true), but between them is the Counter equatorial current setting in the opposite direction and sometimes with great strength.

Though the limits of the Counter current are imperfectly defined, it appears to lie always northward of the equator, generally between the parallels of 4° and 9° N. lat., more commonly between 5° N. and 8° N., though sometimes its influence has been felt almost down to the equator, and it never exceeds 5° in width. It varies greatly in strength, running from half a knot to 2 knots an hour and, so far as is known, varies also with the season, being stronger from May to October than during the other half of the year, when it sometimes appears to cease. The lines of division between the Equatorial and Counter equatorial currents are sometimes distinctly marked, the streams of the former being generally at their greatest strength when near these lines of division.

The Equatorial current is very strong in places, the southern branch being as a rule the strongest; it has been recorded as running more than 4 knots. In 1875, H.M.S. *Challenger*, on her passage from Honolulu to Tahiti, experienced very strong currents, and found the Counter current farther northward than usual, the Equatorial current only extending southward to lat. 11° N. with a general direction of S. 60° W. 18 miles per diem; its rate may, however, be anything between 12 and 40 miles per diem. From 11° to 6° N. the Counter current was running to the eastward at an average rate of 30 miles per diem, but in lat. 7° N., its rate was 50 miles a day, and the temperature of the water was at its highest, from 80° to 82°.

From 5° N. to 5° S. the southern Equatorial current was running to the westward at an average rate of 43 miles a day, but in 1° N. its velocity was no less than 70 miles per day. (In September to November 1878, as much as 104 miles in one day was experienced in H.M.S. *Opal*.) Its temperature varied from 79° to 77°, being 77° at its axis of greatest rapidity. This extraordinary rate was also experienced by the French corvette *L'Eurydice* in the month of August 1857, in 3° 50' N.

**In the North Pacific**, on approaching the Asiatic side, the Equatorial current turns off to the right, and as the Kuro Siwo, or Japanese current, passes the Japanese islands in a north-easterly direction; it then traverses the ocean towards Alaska and then flows along the western coast of North America to the south-east, finally rejoining the eastern part of the Equatorial current and thus completing the circuit. There is a notable subordinate eddy turning from right to left in the bay

of Alaska; and a small cold southerly current from Kamchatka and from the sea of Okhotsk towards Japan, but scarcely any perceptible supply of cold water enters the Pacific from the northward by way of Bering strait.

The western part of the current down the American coast turns westward and northward in a wide circle northward of the Sandwich islands, and finally rejoins the northerly, easterly, and south-easterly current across the ocean, thus completing a subsidiary circle of its own.

**In the South Pacific**, even within the region of the Equatorial current, the stream amongst the island groups in the western half of the ocean is very irregular, and southward of them the water has a general tendency to flow off in some southerly direction. Eastward of the Tuamotu archipelago however, the southern part of the Equatorial current appears to turn off to the southward, then south-eastward towards Magellan strait, but the greater part turns eastward and northward up the coast of South America until it again rejoins the eastern part of the Equatorial current, thus completing a circuit somewhat similar to that described in the North Pacific.

**Currents amongst the Eastern island groups.**—Near Pitcairn island the current generally runs to the westward at about 12 miles a day; but among the Tuamotu archipelago the currents are very irregular. During settled weather and a steady trade, the set is usually to the westward from 5 to 25 miles a day; but when the wind is westerly, which is frequently the case between October and March, the current is reversed and runs to the eastward from one to two knots an hour. The uncertainty on these occasions, as to the direction in which the current may be running, renders great caution necessary when navigating among this mass of islands.

Among the Cook and Society islands, the westerly set is fairly regular, and runs at from 12 to 20 miles a day; but strong winds from the opposite direction are liable to influence the rate, and at times, reverse the direction of the current.

On nearing the equator, the westerly current, as before remarked, will be found to increase in strength, and amongst the Marquesas runs from half to  $2\frac{1}{2}$  knots an hour; but even here, when strong westerly winds have been blowing, the surface water has been observed to run eastward in the channels between the islands.

Near Starbuck and Malden islands, in lat.  $5^{\circ}$  S., the current attains a rate of from 32 to 56 miles a day to the westward, and much care is requisite when approaching these islands to keep well to the eastward, as with a light trade there would be great difficulty in beating back against the current.

Near Christmas island in lat. 2° N., the current generally runs strongly to the westward and north-westward, as much as 37 miles a day; but the counter current has been experienced nearly as far South as the equator, and caution is therefore necessary in obtaining good astronomical observations to check the position of the ship.

Among the Sandwich islands the current is generally running westward at from one to 1½ knots an hour, but it varies a good deal, and runs in the opposite direction at times without any apparent cause.

A more detailed account of the currents among the groups of islands is given in the description of the several groups.

**Currents in Barrier reef and Atoll openings.**—It may be here remarked that the streams in these passages are generally very strong, and cannot be calculated upon to turn with high and low water. Where a Barrier reef is near the shore, a heavy swell will throw so much water over the reef as to cause a constant set out of the opening, and at times across the fairway; a knowledge of these facts should be borne in mind when navigating such localities; an instance of this latter is very marked at Papieté, in Tahiti (*see* page 60); also at Taapuna pass in the same island (*see* page 63); again at Mururoa (*see* page 116); and at many other places too numerous to mention.

**CAUTION.**—Particular and constant attention must be paid to current when navigating amongst the groups; for, when near the islands, it is sometimes deflected and always accelerated. Again, most of the islands are so low that it is often impossible to see them at night, and ships may be driven on the encircling reefs without any warning from the lead, the reefs having, in general, very deep water close-to.

**VIGIAS.\***—In no part of the world are there so many dangerous coral reefs and low islets rising abruptly from great depths, as in the Pacific ocean; in addition, a vast number of *vigia* have from time to time been reported. Many of these have been disproved of late years by laborious search, but many are still on the charts, and until the existence of doubtful shoals has been clearly disproved, they must remain a source of anxiety and perplexity to the navigator. A great number of these reports are from whaling ships, and it is a common saying among whaling captains “that they do not care where their ship is, so long as there are plenty of whales in sight;” thus, doubtful navigation and strong currents account for a large proportion of *vigia* that encumber or have encumbered the charts of the Pacific ocean.

It is, therefore, most earnestly urged upon those who may observe the appearance of a danger to obtain soundings from a boat if possible. The

---

*See* chart, No. 2,683.

\* A *vigia* is a reported shoal, the existence of which or its exact locality is doubtful.

appearances of *vigia* sometimes caused by reflection from the clouds, by volcanic disturbance, by shoals of fish, and by marine animalculæ, often resemble reefs and breakers so closely as to deceive the most experienced. A few examples are here appended.

Captain Maclear (H.M. surveying-vessel *Alert*) remarks "that whenever the sea becomes smooth, *confervoid algæ* appear on the surface, and form masses of discolouration very like the colour of a coral reef some three fathoms below water. The officers of the *Alert* were occasionally deceived by these; also, when there is any meeting of currents of different temperatures shoals of fish often appear, and large fish splash and spout water so as to resemble breakers; I have little doubt that these are the principal sources of *vigia*."

Navigating Lieutenant W. H. Petley, H.M. surveying-vessel *Alert*, states that on December 26th, 1880, when searching for Le Rhin breakers, "he saw what he felt confident were breakers, but upon examination it was merely large fish jumping and throwing the water high in the air, no bottom at 300 fathoms could be obtained at the spot." Also, "during the run on the parallel of  $24^{\circ} 14' S.$ , from long.  $176^{\circ} 2' W.$ , to  $179^{\circ} 18' W.$ , we passed through dense fields of *sea sawdust* or *confervæ*. Twice the ship was suddenly hove to in broad daylight in consequence of the appearance presented to a reef awash, but no bottom could be obtained at 300 fathoms."

E. W. Creak, Master, R.N. (1866), remarks that H.M.S. *Esk* left Ngaloa harbour, Kandavu island, for Sydney, and after running a distance of about 40 miles, the officer of the watch observed the ship to be standing into a crescent-shaped patch of discoloured water, extending from right ahead to the port beam. The ship was immediately hove to, and a boat despatched to examine the locality; on pulling into the midst of it, the discolouration was found to be caused by a light brown substance floating in a thin film on the surface of the water, about one mile in length and 50 yards in breadth. The substance, on being placed under the microscope, was found to be vegetable matter, and a species of *oscillatoria*.

At the Fiji islands on two days in November, between 3 a.m. and sunrise, the sea worm, called by the natives "Balolo," appears upon the coral reefs in great numbers. The Fijians esteem it a great delicacy. Upon its appearance (which is sudden) the natives muster in force to collect it. The Europeans longest resident in the group are unable to predict the probable time of its appearance.

When the "Balolo" appears a thick white scum is given off, which floats away to sea in vast fields. These fields of scum are frequently mistaken for reefs even by local traders of experience. There appears

---

See chart, No. 2,683.

but little doubt that many reefs reported near Fiji are nothing but this scum, or the *conservæ* so often seen by navigators of the Pacific Ocean.

In July 1888, when H.M.S. *Egeria* was searching for the Pelorus reef, and was about to slip a beacon on a bank which had been found, discoloured water was reported from the masthead. This was almost immediately seen from the deck and by 9 a.m. the beacon was dropped in 24 fathoms, with a stretch of light greenish water extending in a northerly and southerly direction for about half a mile.

The whalers were lowered and remained all day in this green water endeavouring to find a shoaler cast. Meantime more discoloured water was reported from aloft; this being verified by an officer, Captain Aldrich left the boats near the beacon and took the ship towards the discoloured patch. After going 2 miles the small streak was seen from the poop of the vessel. It had remained as steady as possible, and had every appearance of being a very small shoal.

The ship was taken to within 100 yards of the discoloured patch, and the dingy lowered to get a sounding on it; no bottom, however, could be reached, so the ship was put in the middle of the patch, and a sounding of 150 fathoms, no bottom, obtained. A bucket of water was drawn and a bottle of it preserved, but Captain Aldrich did not see anything in it to account for the light greenish colour; it may be that the colouring matter was not actually on the surface. The fact remains that this small patch was sighted from aloft at very nearly 3 miles distance, and that even when within 100 yards of it, it was believed to be shoal water, and that a sounding of 150 fathoms, no bottom, was obtained in the middle of the patch. In these cases, it would appear probable that the discolouration was caused by organisms hatched on the bank, the matter floating away as above mentioned in the case of the "Balolo."

Commander Oldham, H.M. surveying-vessel *Egeria*, 1889, reports that much green water, having the appearance of shoals, was met with between Tongatábu and Falcon island, but, on sounding in it, deep water was found, and the sea contained minute particles of volcanic matter. Doubtless many of the shoals reported in the Tonga group, and upon which no sounding has been obtained, are similar appearances to the above.

Commander Nicolls, H.M.S. *Cormorant*, on the passage from Malden island to Penrhyn island, observed what was thought to be a shoal about 4 miles distant. "It presented the appearance of waves breaking over rocks just under water. Lowered a boat to examine it. Shoal disappeared. I take it to have been a shoal of *bonitas*, as since then we have had the same thing close alongside caused by these fish."



In 1894, H.M. surveying-vessel *Penguin*, searching for the Ocean Ranger reef reported to exist in lat.  $18^{\circ} 44''$  S., long.  $157^{\circ} 2'$  E., discovered a bank of from 800 to 1,000 fathoms in depth situated between the parallels of  $18^{\circ} 48'$  and  $19^{\circ} 5'$  South latitude, and the meridians of  $156^{\circ} 40''$  and  $157^{\circ} 3'$  East longitude, and with depths of from 1,500 to 1,800 fathoms around, but no shallower soundings could be obtained.

During the search, and whilst obtaining a sounding of 1,713 fathoms, a considerable tide rip was observed extending about 3 miles in a North and South direction from the ship, the ship herself being in the centre of the rip, which might have been mistaken for breakers, and some such phenomenon probably was the origin of the report made by the Master of the *Ocean Ranger*.

Doubtless many such tide rips are reported as "breaking reefs."

Another remarkable case is that reported by Mr. Jno. G. Hitchfield, master and owner of the Hawaiian schooner *Lilian*, who states, as follows: "On October 25th, 1893, during an ineffectual attempt to find the shoal charted in lat.  $10^{\circ}$  N., long.  $179\frac{1}{2}^{\circ}$  W., I saw what I felt confident were breakers of considerable height—the surrounding sea comparatively smooth. I steered for them for a couple of hours, watching with my glasses from the masthead. They seemed to get gradually plainer and then suddenly vanished. The only way I can account for this delusion is by double reflection (probably of the very shoal I was looking for) from the shoal to the clouds and back to the sea at the angle of incidence. The breakers were so perfect there was no mistaking them for a large shoal of fish." Notwithstanding the last remark, it seems likely, from the experiences of Commander Nicolls and others, that the "shoal of fish" solution is probably correct, though Mr. Hitchfield is well known as a careful observer and recorder of interesting facts in Pacific navigation.

**COAL.**—The only places, the description of which are comprised within this volume, at which large stocks of steaming coal are kept are Honolulu in the Sandwich islands, and Tahiti in the Society islands. About 200 tons is generally in stock at Rarotonga, and small quantities may be had at Malden island and at Hilo, Hawaii; at several other islands a few tons have been occasionally obtained as mentioned in the body of this work, but no supply can be depended on.

**UNIFORM SYSTEM OF BEACONAGE.**—In 1893, the French Government adopted the following system for their possessions in the Pacific, viz., the Tuamotu archipelago, Society islands, and Tubuai or Austral islands, including Rapa or Oparo island:—

"Entering from seaward, starboard hand beacons are painted red and surmounted by conical top-marks. Port hand beacons are painted black and surmounted by cylindrical top-marks."

---

See chart, No. 2,683.

**NAVAL DOCKYARDS and ESTABLISHMENTS**

of any importance do not exist at any of the islands within the scope of this work. At Tahiti there is a small patent slip and a Government machine shop capable of doing minor repairs, and at Honolulu there is a larger patent slip and facilities for more considerable repairs; but there is no dry dock, Government or private, at any of the islands.

In the Tuamotu archipelago, it is probable that many of the lagoons afford places suitable for heaving a ship down in case of necessity; one such, in the island of Takarava, is suggested by French officers as suitable for this purpose; but, in any such case, the repairs to be effected would depend entirely upon the resources of the damaged vessel herself both as regards work and materials.

**NATIVES.**—The great Pacific basin has been divided for ethnological discussion into six portions, named respectively, Australia and Tasmania; Malaysia, including the islands of the Malay archipelago from Sumatra to the Moluccas and Philippines; Melanesia, including the chief islands inhabited by the black and woolly-haired race from New Guinea to Fiji; Polynesia, including all the larger islands of the central Pacific from the Sandwich islands southward; Micronesia, comprising the small islands of the North Pacific; and, lastly, the New Zealand group.

**MISSIONS.**—Missionaries or teachers are established on nearly all the inhabited islands described in this volume, and the natives, having very generally adopted some form of Christianity, have become friendly; shipwrecked persons need have no hesitation in landing at any place, as they will almost certainly be kindly treated and cared for. Unhappily the native populations seem to be very generally decreasing.

The natives of the central and eastern Pacific islands are mostly Wesleyans and Congregationalists, the missions being chiefly maintained by the London Missionary Society. The Boston Board (U.S.) of Foreign Missions (Congregationalists) also take a large part in native instruction in various groups of the Pacific islands, as do also various Roman Catholic missions.

**COMMUNICATIONS.**—The following steam communication exists between the coast ports of the Pacific and some of the islands described in this volume:—The Pacific Mail Steamship Co. (American), and the Oriental Steamship Co. (British), run vessels jointly from San Francisco to Yokohama, Kôbé, and Hong Kong, calling at Honolulu once a month. A new Japanese line of mail steamers, largely officered by English, also works on this line in conjunction with the other two com-

---

See chart, No. 2,683.

panies named. The three vessels of the Oceanic Steamship Co. (two British and one American) call at Honolulu on their way between San Francisco and Australia. The Canadian and Australasian R.M. Steamship Co. also has three steamers running between Victoria, B.C., and Sydney, starting from Victoria on the 16th of each month, and calling at the Hawaiian islands, Samoa, and Fiji on the way.

An Auckland firm, under contract with the New Zealand Government, dispatches a steam-vessel regularly (every six or seven weeks) from Auckland to Tonga, Samoa, Rarotonga, and Tahiti.

Other firms send sailing vessels to the different groups.

The vessels of the German Company, "Deutsche Handels-und-Plantagen-Gesellschaft Zum-Süd-See Inseln," locally abbreviated to the "L.H.," or "Long-handled" company, trade to Tahiti, Tonga, Samoa, and also to most of the islands in Melanesia.

A monthly postal service between Tahiti and San Francisco is carried on by sailing schooners, fitted for carrying passengers. These vessels leave San Francisco on the first of every month, calling at the Marquesas about the 24th, and arriving at Tahiti about the 30th of the month. They leave again on the 12th of each month, and take about 32 days to return to San Francisco without touching at any port.

**PASSAGES.—BETWEEN AMERICA and the PACIFIC ISLANDS.—Full-powered steamers.**—From the islands to the coast, follow the great circle track; from the coast to the islands, the rhumb line.

**Sail and Auxiliary steam routes.**—When bound for the islands from ports on the coast of North or South America, a glance at the Admiralty wind and current charts will show the advisability of getting into the trade wind as soon as possible, and then running with it to the destination.\*

In the return route, vessels must cross the trade wind in either hemisphere to get into the westerly winds to make their casting, and then coast along to their ports.

**BETWEEN THE VARIOUS GROUPS, GENERAL.**  
—Full-powered steamers proceed as direct as possible.

See chart, No. 2,683.

\* On the 21st November 1895, H.M.S. *Wild Swan* sailed from Esquimalt, and arrived at Honolulu on December 12th, making the passage as advised for auxiliary steamers. With reference to this passage, the Navigating Officer, Lieut. S. Sladen, R.N., states as follows:—"From the experience gained on this passage, I should always, in future, during the winter months, when proceeding from Esquimalt to Honolulu, go on a direct track in an auxiliary steamer; always endeavouring, of course, to make southing when the wind was not fair. Had we carried out this plan I think the passage might have been shortened by several days."

**Sail and Auxiliary steam routes.**—Within the region of the trade winds, auxiliary steamers have very little advantage over sailing vessels for they must follow nearly the same tracks. From East to West there is no difficulty, the winds being fair. From West to East, for short distances, a vessel may beat or steam; but for long distances, as for instance from Fiji to Tahiti or from Tahiti to Pitcairn island, a vessel should stand through the trade wind into the westerly winds, then run down her easting and re-enter the trade wind in about the meridian of the island bound to.

**BETWEEN MAGELLAN STRAIT or C. HORN and the ISLANDS.**—Full-powered steamers if bound to Tahiti should steer to cross lat.  $30^{\circ}$  S. in about long.  $97^{\circ}$  W., and from thence proceed southward of Pitcairn island and the Tuamotu archipelago for their port—distance from C. Virgins, 4,960 miles. If bound for Honolulu, from  $30^{\circ}$  S. and  $97^{\circ}$  W. steer direct—distance from C. Virgins, 3,660 miles.

**Sailing route.**—If bound to Honolulu, when in the S.E. trade proceed direct; if for Tahiti, pass southward of Pitcairn island and the Tuamotu archipelago.

**Auxiliary steamers** having passed through Magellan strait should make westing until in about  $80^{\circ}$  W. and then proceed on the sailing route, making use of their steam through the variables and doldrums.

**RETURN ROUTE.**—Full-powered steamers take as direct a route as possible and pass through Magellan strait.

**Sail and Auxiliary steam routes.**—From any of the Pacific islands, stand through the trades to the southward and then into the westerly winds of the southern hemisphere; from thence, proceed by great circle to the strait of Magellan or to round C. Horn.

**SYDNEY or WELLINGTON, N.Z., to TAHITI.**—Full-powered steamers, as direct as possible both ways; distance from Sydney to Tahiti, 3,300 miles; from Wellington to Tahiti, 2,340 miles.

**Sail and Auxiliary steam routes.**—Proceed from Sydney through Cook strait, passing Wellington; from thence, run down easting southward of  $40^{\circ}$  S. until in  $156^{\circ}$  or  $155^{\circ}$  W., then edge away to the northward to cross  $30^{\circ}$  S. on the meridian of Tahiti and from thence proceed direct. In returning, if for Sydney, a vessel should run with the trade, pass about 150 miles south-eastward of New Caledonia, and then proceed direct. If for Wellington, run with the trade until in  $170^{\circ}$  W. and then direct.

**TAHITI to HONOLULU and back.**—Full-powered steamers, direct both ways :—distance 2,360 miles.

**Sail and Auxiliary steam route.**—Cross the equator in about 147° W., and make the Sandwich islands from the eastward so as to ensure the breeze. In the return route cross the equator as far eastward as possible. It is even recommended to keep to the northward and make easting before standing through the trades.

**FIJI to HONOLULU and back.**—Full-powered steam route, direct both ways :—distance, 2,760 miles.

**Sail and Auxiliary steam route.**—Stand through both trades and into the westerly winds northward of the north-east trade ; from thence make easting to about 155° W. ; and from thence proceed direct. In returning, proceed direct.

**YOKOHAMA to HONOLULU.**—Full-powered steamers take the great circle course both ways.

**Sail and Auxiliary steam route.**—Make easting in from 40° to 43° N. until on the meridian of 155° W. when steer for the island, allowing about 24 miles a day for westerly current as it is approached.

**HONOLULU.—Distances.**—The distances not hitherto given from Honolulu to other principal ports around the Pacific by full-powered steam route are as follows :—To Valparaiso, 6,082 miles ; to Callao, 5,180 miles ; to San Francisco, 2,090 miles ; to Esquimalt, 2,340 miles ; to Yokohama, 3,200 miles ; to Hong Kong by Bashee channel, 5,740 miles.

**TRADE WIND TABLES.**—The tables on the following pages, showing the limits of the Trade winds in the Pacific ocean, in each month, were prepared by the U.S. Hydrographic department in 1895, as regards the southern limit of the S.E. trades, from a comparison of nearly 1,500 trade wind reports ; and the remaining limits, from the most recent pilot charts of the North Pacific.

---

See chart, No. 2,683.

## NORTH-EAST TRADES.

Month.	Approximate Northern Limit.								Approximate Southern Limit.							
	110° W.	120° W.	130° W.	140° W.	150° W.	160° W.	170° W.	180°.	110° W.	120° W.	130° W.	140° W.	150° W.	160° W.	170° W.	180°.
January	N. ° 13	N. ° 21	N. ° 28	N. ° 27	N. ° 23	N. ° 23	N. ° 24	N. ° 24	N. ° 8	N. ° 8	N. ° 8	N. ° 6	N. ° 5	N. ° 4	N. ° 3	N. ° 3
February	—	—	27	28	29	28	24	22	5	6	6	6	5	6	7	8
March	—	—	24	25	26	26	24	23	6	6	5	4	4	4	4	4
April	—	—	27	29	30	28	28	28	6	6	6	6	6	6	5	6
May	—	—	28	27	30	28	27	26	10	9	8	8	8	7	5	5
June	—	—	30	31	31	31	31	30	11	12	11	10	9	9	7	7
July	—	—	—	33	34	33	33	33	14	14	13	11	9	7	6	6
August	—	—	—	34	34	33	32	32	—	15	14	10	9	9	7	7
September	—	—	—	30	31	29	30	30	14	15	14	12	11	11	11	11
October	—	—	22	28	30	29	28	28	—	13	13	11	10	11	9	5
November	—	—	24	28	29	28	27	26	11	11	11	10	9	8	7	6
December	—	—	24	27	28	28	26	25	8	9	9	9	8	7	6	5

## SOUTH-EAST TRADES.

Month.	Approximate Northern Limit.								Approximate Southern Limit.								
	110° W.	120° W.	130° W.	140° W.	150° W.	160° W.	170° W.	180°.	80° W.	90° W.	100° W.	110° W.	120° W.	130° W.	150° W.	165° W.	180°.
	N. ° 4	N. ° 5	N. ° 4	N. ° 4	N. ° 3	N. ° 2	N. ° 1	N. ° 1	S. ° 28	S. ° 29	S. ° 26	S. ° 20	S. ° 29	S. ° 24	S. ° 24	S. ° 28	S. ° —
January -	3	4	4	4	5	—	—	—	30	28	23	15	25	30	26	25	33
February	3	3	3	3	3	2	0	—	27	27	24	15	22	23	24	22	—
March -	3	3	3	3	3	2	1	—	27	26	25	18	26	25	18	26	33
April -	4	5	4	4	4	3	2	—	25	24	20	18	20	23	16	27	—
May -	5	8	7	6	5	4	3	3	19	24	23	24	22	25	19	25	—
June -	7	7	7	7	7	5	4	3	28	27	21	24	26	21	17	23	27
July -	8	8	8	8	7	6	5	4	28	24	23	18	18	25	18	25	28
August -	7	9	9	9	7	7	7	6	21	23	23	22	19	23	18	25	—
September	6	5	7	8	8	7	7	—	26	27	24	22	23	24	20	25	25
October -	6	6	7	6	5	4	3	3	30	28	24	21	19	22	21	24	—
November	5	6	6	6	5	4	3	2	29	29	29	23	21	25	24	26	33
December																	

## CHAPTER II.

SOUTHERN OUTLYING REEFS AND ISLANDS.—TUBUAI, COOK,  
AND PALMERSTON ISLANDS.

## VARIATION IN 1900.

---

Rarotonga, Cook islands,  $9^{\circ} 30' \text{ E.}$  | Rapa island    -    -     $10^{\circ} 45' \text{ E.}$

---

Before proceeding to a description of the better known groups of the South Pacific, it will be well to give a short description of the southern outlying reefs and islands, some of which lie so far out of the ordinary track of shipping that their position is in all cases very doubtful, and in some cases even their existence is questionable.

**DOUGHERTY ISLAND**, one of the most desolate and isolated spots in the ocean, was reported by Capt. Dougherty of the whaler *James Stewart* as having been sighted by him, May 29th, 1841; he passed within 3 cables of it, running 10 knots, and estimated it to be 5 or 6 miles long N.E. and S.W., with a high bluff at the north-eastern end and low land at its south-western point. Between the ends there appeared to be a valley covered with ice and snow. He estimated its position to be, approximately, latitude  $59^{\circ} 20' \text{ S.}$ , longitude  $120^{\circ} 20' \text{ W.}$

On the 4th September 1859 Capt. E. Keates of the *Louise* of Bristol sighted evidently the same island, though he places it farther eastward, viz., lat.  $59^{\circ} 21' \text{ S.}$ , long.  $119^{\circ} 7' \text{ W.}$ ; he describes it as a round island, of a dark colour, and 80 feet high, with an iceberg aground on its north-western side. Several other icebergs were sighted about the same time.

There is no other record of Dougherty island having ever been sighted and it is charted in the Admiralty charts as 300 feet in height, and in the position assigned to it by Capt. Dougherty, whilst French charts have adopted that of Capt. Keates.

**NIMROD ISLANDS** are stated to have been seen by Capt. Eilbeck of the ship *Nimrod* in 1828 in her passage from Port Jackson round Cape Horn. They appear to have been seen at a considerable distance, but numerous birds were also seen and much marine vegetation was floating about, indicating their actual existence. Capt. Eilbeck placed the group in lat.  $56\frac{1}{2}^{\circ} \text{ S.}$ , long.  $158\frac{1}{2}^{\circ} \text{ W.}$

---

See Admiralty charts :—Pacific Ocean, Nos. 2,683 and 783.



A Captain Biscoe sought ineffectually for this group in 1831, but his search was directed to lat.  $56^{\circ} 3' S.$ , long.  $157^{\circ} 50' W.$ , which might account for his not finding them. Many birds and marine vegetation were however seen, and this was again the case in the following year nearly  $2^{\circ}$  farther eastward.

The group is charted as "doubtful," in lat.  $56^{\circ} 20' S.$ , long.  $158^{\circ} 30' W.$

**MARIA THERESA REEF**, which was reported in 1843 by Captain Tabor of the *Maria Theresa* to be in lat.  $37^{\circ} 0' S.$ , long.  $151^{\circ} 0' W.$ , is placed by subsequent investigation in lat.  $37^{\circ} 0' S.$ , long.  $151^{\circ} 13' W.$

**Jupiter breakers.**—Mr. Ringe, commanding the German barque *Jupiter* on a voyage between Newcastle (New South Wales) and Tahiti, reported having passed breakers during the night of December 3rd, 1878, in lat.  $36^{\circ} 37' S.$ , long.  $150^{\circ} 15' W.$  The breakers were observed in two places, each of which had a diameter of about 30 yards, and appeared to be a quarter of a mile apart. No further intelligence has been obtained regarding this shoal.

**WACHUSETT REEF.**—Captain Lambert of the American ship *Wachusett* reports that on June 4th, 1899, about 9 a.m., the sea being smooth and the weather clear, he passed over a reef, which appeared to be of coral formation, in approximately lat.  $32^{\circ} 18' S.$ , long.  $151^{\circ} 8' W.$  The reef appeared to be about 500 feet wide. The bottom showed of a dark grey colour with deep blue on both sides of the reef. The depth was estimated at from 5 to 6 fathoms; unfortunately no soundings were taken.

**L'ORNE BANK.**—On September 11th, 1874, in fine weather, smooth water, and a breeze from S.S.E., the French transport *L'Orne*, standing to the eastward at the rate of 7 knots, passed over and apparently touched upon a bank, on which, almost immediately afterwards, a depth of 16 fathoms rock was found; with the vessel hove-to for nearly an hour, head to the eastward, the depths increased to 19 and 34 fathoms rock, and fine sand. About 3 miles eastward of the first sounding there were 52 fathoms, rock, and at a distance of 5 or 6 miles East from the 16-fathoms spot, no bottom was obtained at 98 fathoms. The approximate position of the depth of 16 fathoms, deduced from good observations, is in lat.  $27^{\circ} 42' S.$ , long.  $157^{\circ} 44' W.$

In 1887 the French man-of-war *Fabert* searched for L'Orne bank, and sounded over a space some 50 miles in extent; she did not find the shoal spot described by *L'Orne*, and only succeeded in getting bottom three times, viz., in 34, 35, and 68 fathoms, rock, in lat.  $27^{\circ} 42' S.$ , long.  $157^{\circ} 36' W.$ , or about 8 miles eastward of the depth of 16 fathoms, reported by *L'Orne* in 1874.

---

See Admiralty charts:—Pacific Ocean, Nos. 2,683 and 783.

**HAYMET ROCKS** were reported by J. E. Haymet, master and owner of the cutter *Will Watch*, when on passage between Auckland and Rarotonga in 1863; the cutter passed between two rocks and struck on the northern of the two, damaging her false keel. The rocks are said to extend over a space of about a quarter of a mile, to have been distinctly seen, and with apparently 7 or 8 feet water on them. Mr. Haymet gives their position as lat.  $27^{\circ} 11'$  S., long.  $160^{\circ} 13'$  W., which would place them about 135 miles W.  $\frac{1}{4}$  N. from the position assigned to L'Orne bank.

These rocks were unsuccessfully searched for, in the position given, by H.M.S. *Satellite* in 1886, and again by the French Government vessel *Fabert* in 1887; the latter vessel spent three days in the search under favourable circumstances of wind and weather, running over some 253 miles within a radius of from 20 to 25 miles of the position assigned, and with no result.

In December 1882, however, Lloyd's agent at Rarotonga reported that the Haymet rocks were supposed to exist about 150 miles S.S.W. of Rarotonga, and therefore right in the track of vessels bound from Auckland to that island, who always give this supposed position a wide berth. If this information is correct, these rocks are about 240 miles N.N.W.  $\frac{1}{4}$  W. of the position as given by Mr. Haymet and still shown on the charts; and it is not surprising that both the *Satellite* and the *Fabert* failed in their search at an entirely different locality.

A depth of 68 fathoms, rock, was found by the *Fabert* in lat.  $24^{\circ} 7'$  S., long.  $158^{\circ} 33'$  W. This vessel was at the time searching for a low island which had been reported to exist in this neighbourhood but of which she saw nothing.

**MARETIRI or BASS ISLANDS** consist of four small islets, lying about 46 miles E. by S. of Rapa island. The South-east rock, 346 feet above the sea, is the highest of the group. The western rock is 280 feet high and the north-eastern rock 195 feet high; between these are two remarkable columnar rocks 135 feet high. In the north-western part of the group are four rocks of less height. All these rocky islets are abrupt, and without vegetation or any low ground.

The greatest diameter of the group between one of the low northern rocks and the South-east rock, is about 2 miles; and within the outer rocks the whole area is full of rocky heads. Rocky soundings extend for about one mile all round the group.

**RAPA or Oparo island.**\*—This island, which was formally taken under French protection in March 1881, was discovered by Vancouver on 22nd December 1791. It is about 380 miles S.E. by E. from Tubuai,

---

\* See Admiralty plan :—Rapa island; scale,  $m=3.5$  inches, No. 29.

forming a prolongation of the chain of islands of that group. The islet of Tauna in the entrance of Ahurei bay, as described at page 31, is in lat.  $27^{\circ} 35' 46''$  S., long.  $144^{\circ} 17' 20''$  W.

Rapa island is circular but of a very irregular form, about 15 miles in circumference, with several deep indentations in the coast, the largest of these being Ahurei bay. The coast is bold, and has no off-lying dangers beyond half a mile from the shore, but many of the smaller bays, though full of shoals and not to be entered by a stranger without a native pilot, afford anchorage to schooners and have beach at their heads; everywhere else the coast is quite inaccessible, with deep caverns worn in the cliffs by the action of the sea.

Both the form and appearance of the island are remarkable, it being evidently an ancient volcano, of which the head of Ahurei bay was the crater, and the high craggy mountains surrounding this crater form in several places most remarkable pinnacles, with nearly perpendicular cliffs from their summits to the sea. The highest point of the island, mount Perahu, is close to the shore on the western side, and rises to a height of 2,077 feet; it may be seen from a distance of 55 miles. The next in height is mount Pokumaru, 1,915 feet; it is on the southern side of the island. Nine other peaks rise to over 1,000 feet and several others to nearly that height.

The mountains on the eastern side of the island are generally either bare or with a growth of stunted trees; on the western side, on the contrary, they are covered with a rich vegetation, and most noticeably with forests of large tree ferns. All the mountain summits not absolutely inaccessible, and all the principal passes from one valley to another, are commanded by well constructed hard cemented stone forts, generally built in the form of flat terraces, and each commanded by a tower.

These constructions are very ancient, and the natives explain their existence by stating that the island formerly contained a numerous population, divided into tribes constantly at war with one another.

Vancouver estimated the population at 1,500 at the time of his visit, but these inter-tribal wars must for years have been doing their work of destruction; and further mischief in modern times has accrued to these people by epidemics introduced by European vessels. The present remnant of inhabitants are in appearance a fine well made race, strong and industrious, somewhat resembling the natives of New Zealand, claiming to be of Maori blood, and speaking the ancient language of that race, which also closely resembles that spoken at the Gambier islands and at the Marquesas. The Tahitian dialect is also understood, and forms part of the language of Rapa. The whole native population, in 1892, numbered only about 200, but was said to be then increasing.

The inhabitants are chiefly to be found in three small villages, viz., Ahurei, on the southern side of the bay of that name, where also is stationed the French Resident; Area, on the northern side of the same bay; and Tubuai, at the head of a bay in the northern part of the island. There are also a few scattered residences in the different valleys.

**Productions.**—The taro-root is the chief product of the island and grows abundantly; being a water plant, it requires great care in its culture, and, testifying to the extent of the ancient population, the valleys are all arranged in level terraces supported by stone walls, over which spaces the running streams could be turned at pleasure for irrigation purposes. These ancient works are still utilized by the sparse modern inhabitants.

The orange and banana have been introduced, also potatoes and most European vegetables, as also the vine; but cocoa-nut trees do not flourish.

The island is over-run by goats, and pigs may be obtained; all sorts of fish and lobsters abound. Sharks also are very numerous.

**Coal** has been discovered in the northern part of the island, but no attempt at working the seam has been made. A sample of surface stuff tried by a French despatch boat gave very fair results.

A French war vessel visits Rapa and other islands every three months, taking stores and provisions from Tahiti for the officials.

**Winds and Weather.**—The prevailing winds during eight months of the year, from October to April inclusive, are from the eastward, but about once in three weeks, during December, January, and February, westerly winds occur for a short period. From May to the middle of September westerly winds, with heavy showers, prevail, blowing in gusts down the valleys of Ahurei bay. From native report, hurricanes are sometimes experienced, destructive to houses and rooting up the trees. Gales of a cyclonic character, though not common, occur at all times of the year.

The climate generally is temperate but moist, rains being frequent and the island often covered with cloud and fog when the weather is quite fine a few miles distant at sea. The temperature seldom rises above 76° in summer or falls below 58° in winter.

**AHUREI BAY** is a snug anchorage, open to the eastward, about half a mile wide and  $2\frac{1}{2}$  miles deep, the land rising on three sides like the wall of an amphitheatre. The entrance is protected by reefs and islets, which effectually prevent the prevailing easterly winds from sending any heavy sea into the harbour; but this same prevalence renders the exit from the harbour very difficult for sailing vessels. On the southern side, at the

village of Ahurei is the landing place, a stone pier, alongside of which there is only one foot at low water.

The head of the bay, north-westward of Kutuni point is blocked by coral reefs. A conical island of some height, named Tapui, lies at the head about one cable from the beach.

Between Kutuni and Nukutere points on the northern shore, is the village of Area, before mentioned, at the foot of some small cliffs; and at 4 cables E. by S. of Nukutere point, on a shallow bank, is Tauna island, a small sand islet, nearly awash and without any vegetation.

**Entrance.—Depths.**—The entrance channel is only half a cable wide between the reefs, which in places are almost awash, and very intricate, but the depth is great, from 18 to 24 fathoms, with patches of as little as  $6\frac{1}{2}$  fathoms. The water within is deep, the space available for anchorage having from 10 to 29 fathoms, and the bottom is of coral, covered with a thin layer of mud. The squalls from the mountains and high land are sometimes very violent; there is, however, but little danger of dragging, the anchorage being so well protected.

**Directions.—Beacons.**—The entrance channel through the reefs is marked by beacons arranged as to form and colour on the French system, *see* page 19. A conspicuous white pyramid beacon stands on Maomao point and a white triangular iron beacon with globe top-mark on the reef extending from that point; these beacons in line N.  $88^{\circ}$  W. lead up to the entrance. Here the reef on the northern side is marked by a red spindle beacon, and that on the southern side by a black spindle beacon with the usual top-marks. The channel is further marked by five smaller spindles; three, red, on the starboard hand; and two, black, on the port hand. Two white triangular beacons on the shore, about  $2\frac{1}{2}$  and 3 cables westward of Nukutere point, in line on a N.W. by W. bearing, lead in between the reefs from the first leading line, until a white iron tripod beacon with a ball, on the reef opposite mount Tanga, comes on with the extreme of Kutuni point W.  $\frac{3}{4}$  S., which indicates the turning point and leading line into the harbour. But, when abreast of Maomao point, the vessel must edge to the southward to keep in the channel, keeping red beacons on the starboard hand and black beacons on the port hand. When past the white tripod beacon on the shoal, a vessel may anchor anywhere, but the water is very deep. The best anchorage is off Ahurei village, in about 12 fathoms, with the flagstaff bearing about S. by W. Above the village the bay is full of shoals, with deep holes among them.

**Pilots.**—A native pilot boards vessels a little outside Rapa Iti, the high rocky islet almost adjoining the southern outer entrance point.

It is advisable to accept his services, the channels being narrow, the currents irregular, and squalls frequent.

On Saturdays, all the boats of Ahurei go fishing round the island; on that day vessels may therefore expect to be detained some time for the pilot, should the boats be in the southern or western bays. Firing guns at long intervals will generally bring one on board.

**Water** may be obtained on the northern side of the anchorage, at the foot of a small cascade between Temeranga point and Area village.

**Tides.**—It is high water, full and change, at 12h. 10m. Rise of tide 3 feet.

**NEILSON REEF.**—On January 19th, 1827, the ship *Sir George Osborne* passed between two portions of this reef, on which the sea broke in places, it being nearly level with the water. White coral was seen under the ship in from 4 to 6 fathoms, and the reef extended a considerable distance, curving to the south-eastward in the form of a crescent as far as could be seen from the masthead. In 1831, the ship *Lancaster* struck on this reef, the least depth found being 12 feet.

The position given by the *Sir George Osborne* was lat.  $27^{\circ} 0' S.$ , long.  $146^{\circ} 17' W.$ ; but, in 1895, the French vessel of war *Pourvoyeur* determined the correct position of the eastern point of the reef to be lat.  $27^{\circ} 1\frac{1}{2}' S.$ , long.  $146^{\circ} 2' W.$ , which is its position as now charted. It therefore lies about 100 miles W. by N. from Rapa.

**President Thiers reef.**—On January 5th 1897, the French barque *President Thiers* obtained soundings of 19 to 21 fathoms on a bank of broken coral and shells extending about 6 miles N.N.W. and S.S.E. with discoloured water some distance from it, and the least depth obtained, 16 fathoms, at the edge of the bank. The master of the vessel gave the position as lat.  $24^{\circ} 39' S.$ , long.  $145^{\circ} 51' W.$ , and as such it is now charted.

This shoal, therefore, lies N.W.  $\frac{3}{4}$  N. about 200 miles from Rapa, and E. by S. 110 miles from Vavitaö island.

## TUBUAI OR AUSTRAL ISLANDS.\*

This is a scattered group, consisting of five islands surrounded by fringing coral reefs, generally steep-to; they lie between the parallels  $21^{\circ} 40' S.$  and  $24^{\circ} 0' S.$ , and between the meridians  $147^{\circ} 40' W.$  and  $154^{\circ} 45' W.$

The islands Vavitaö, Rurutu, Rimatara, and Tubuai are inhabited and under French protection. Hull island, or ile Maria, as it has been named by the French, is uninhabited, and is the westernmost of the group.

---

\* See Admiralty charts:—Pacific Ocean, General, No. 2,683. Pacific Ocean, S.E. sheet, No. 753. Tuamotu or Low archipelago, No. 767.

**Winds and Weather.**—These islands lie near the limit of the South-east trades; E.S.E. winds are the most frequent and steady during the year. North and N.W. winds generally occur in spring with fine weather, but are often followed by winds from the S.W. which are frequently sudden and violent, veering to South and S.E.

With light N.W. winds, if clouds are observed rising from the southward, a sudden shift of wind from that quarter may be expected, which comes up sometimes in furious squalls. These squalls are especially dangerous to vessels from the Society islands with the wind from N.W., endeavouring to gain the region of variable winds.

Hurricanes are felt among the Tubuai islands (*see* page 11), where they blow with great violence, and follow the usual law in the southern hemisphere; they are experienced during the summer months, especially in March.

The climate is mild and temperate. The seasons are well marked, and with southerly winds the temperature is fresh in winter. The heat in summer is never excessive. The inhabitants of the four islands numbered about 700 in 1892; they are of the Maori race, and speak almost the same language as the Tahitians. They are Christians, and mostly Protestants.

**Products.**—The principal production of these islands is taro, the root of an aquatic plant, and a substitute for the indigenous bread-fruit of the Society islands, which does not flourish here. The taro-root kneaded and slightly fermented is exported to the Tuamotu archipelago under the name of tivo or popoi. The manioc, arrowroot, cotton, tobacco, and sugar cane grow well; bananas, oranges, and yams may also be obtained. Many pigs, fowls, turkeys, and horses are reared here, and there are also goats in a wild state.

**VAVITAO**, also called Ravaivai island (High island), is about 400 miles S.S.E.  $\frac{1}{4}$  E. from Tahiti, lies in lat.  $23^{\circ} 55' S.$  and long.  $147^{\circ} 48' W.$ , and was discovered by Captain Broughton on the 23rd October 1791. It is about 12 miles long in an E.N.E. and W.S.W. direction, with conspicuous high rugged hills, mostly covered with trees, and generally terminating with a gentle slope towards the shore. The population, in 1892, amounted to 270.

The island is surrounded by a Barrier reef, the outer part of which lies nearly one mile from the land and is mostly awash, with numerous wooded islets, especially on its southern and eastern parts; the eastern side of the reef extends seaward in a gradual slope; off the south-eastern part, at  $2\frac{1}{2}$  miles from the land, are from 11 to 16 fathoms, and near the reef from 8 to 9 fathoms. On the western side of the island the Barrier

---

*See chart, No. 767.*

reef is much steeper, and on the western part of it is an islet, which will be seen standing out from the mainland, when approaching from the North.

**Entrances.—Depths.**—Three passages through the reef, all on the northern side of the island, give access to the waters within; they are named the Tetobe, Totorahau, and Ava-hiti passes; the first only is of importance, the last two are only separated from each other by a bank, and lie just eastward of the main pass; they have bars, and, being shallow, are only available for small craft in fine weather. The Tetobe pass is about 2 miles north-eastward of the western islet described, and is the only ship passage to the anchorage. It is about one mile long, with depths of from 5 to  $6\frac{1}{2}$  fathoms, but it is encumbered by several heads of coral having from 3 feet to one fathom water over them. Entering the pass, a sharp look-out from the masthead is necessary to avoid the shoal heads, and a sailing vessel should be under easy canvas. When within the Barrier reef there is a deep water channel completely round the island.

**Directions.**—In approaching from the northward, remember that the entrance pass is about 2 miles eastward of the western islet mentioned. Westward of the highest point of the main island will be seen a hill with a notched V-shaped summit; steer towards the eastern summit of the notch and, on nearing the land, a conspicuous block of rock upon the shore, with a white mark on it, will be seen; this rock cannot be mistaken, as there is no other on the whole length of the shore. The white mark kept to the left of both peaks of the V-shaped summit is the leading mark through the pass to the anchorage.

**Anchorage.**—Ships may anchor within the entrance on the western side of the pass, off the village of Mahuatoa, but with winds northward of East a heavy sea rolls in, and with North or north-westerly winds it would be an unsafe anchorage. Eastward of the pass, and nearer the reef than the land, the anchorage is better at all times, but there would be some danger to a large ship in attempting to reach it, as, with the prevailing winds she would probably have to tack between the reef and the shore.

At the western extreme of the island is the large deep bay of Raiurua, affording excellent anchorage in all winds; it can only be reached with safety by steam-vessels, in consequence of two large coral patches, nearly awash, lying between the reef and the island, about  $1\frac{1}{2}$  cables from point Vaïannaua.

In the south-western part of the island is the anchorage of Teraé; and at the eastern end that of Anatonu.

No water is to be obtained at Vavitao, there being only a few springs used by the natives.

**Tides.**—The greatest range of tide is only about 2 ft. 6 ins.

---

*See chart, No. 767.*



**TUBUAI**,\* about 96 miles W. by N. from Vavitao, was discovered by Cook in 1777, and it was upon this island that the mutineers of the *Bounty* tried to settle in 1789, but quarrelled with the natives and left. The flagstaff at Mataura is in lat.  $23^{\circ} 21' 34''$  S., long.  $149^{\circ} 26' 11''$  W. The island is high and of oblong form, well wooded, and about 5 miles long E.N.E. and W.S.W. by 3 miles wide; from the northward or southward it shows as two islands, which, on a nearer approach, are seen to be joined by low land. The land in the eastern section attains its greatest altitude in mount Taïtu which rises to a height of 1,309 feet, and in its western section in mount Tonarutu, 1,024 feet. Several other peaks are of considerable height.

Tubuai, like Vavitao, is surrounded by a Barrier reef, partly submerged, but rarely with so much as 6 feet over it, of which the outer edge varies from one mile to 3 miles from the shore, the least distance of the reef from the shore being on the north-western side, and the greatest on the south-eastern side of the island. On the north-eastern part of the reef are several islets, and on the north-western part is a large opening which forms the pass leading inside the reefs. There is a passage between the Barrier reef and the island, but encumbered by innumerable coral patches.

A little eastward of the entrance pass is the village of Mataura, where the chief of the island resides, and his flagstaff is a prominent object; on the southern side is the village of Mahua, with a good road connecting them. There are several other small hamlets around the coast, and the population, according to the census of 1892, amounted to 420. There is some little trade between this island and Tahiti.

**Entrance. — Anchorage.**—The principal pass through the reefs is from the northward, and lies about one mile westward of the village of Mataura; it has from  $3\frac{1}{2}$  to 8 fathoms water, but is encumbered by rocky heads, several of which are marked by beacons. Two white triangular beacons at the head of the pass, one on the shore the other on a reef in front of it, when in line S.E. by S. southerly, form the leading line, but for the best water the chart should be consulted. A notch between two moderately high peaks on the western part of the island, bearing S. by E., leads up to the entrance until the leading beacons come in line, and also to the outer anchorage, which is off the entrance of the pass, about 3 or 4 cables outside the reef. In bad weather, this anchorage is only safe with winds between South and E.N.E.; in fine weather, with the wind anywhere round South between S.W. and N.E.; but with the wind from the northward it is most unsafe. The holding-ground is bad, the bottom being coral covered with a thin layer of mud.

---

\* See Admiralty plan:—Tubuai island, No. 2,868; scale  $m = 1.85$  inches; and anchorage; scale,  $m = 3.7$  inches.

Westward of the main pass is the pass of Vapea, deep, but so narrow that it is only used by small craft passing outwards through the reef. At the south-western corner of the Barrier reef is another small opening called the pass of Hue, used by small craft in fine weather. From this, round southward and eastward to the isles on the N.E., the Barrier reef is without a break, but between those isles and the main pass are several small boat openings.

The main entrance pass is, however, the only one that can under any circumstances be taken with safety by vessels of more than 40 tons. When inside the Barrier reef, the island may be circumnavigated by small schooners with the aid of perfect local knowledge.

Mataura anchorage is within the Barrier reef off the village of Mataura; it is a good anchorage for steamers up to 12 feet draught. When half way in by the main pass, a black beacon 13 feet high, on a rock which dries, has to be left on the port hand, passing round which a red beacon is left on the starboard hand and a second black beacon on the port hand; about 5 cables from the latter, steering parallel with the shore, is the anchorage.

Any stranger wishing to take up this or any other inner anchorage should obtain a pilot.

**RURUTU**, also called Oheteroa, situated 115 miles W. by N.  $\frac{3}{4}$  N. from Tubuai, is in lat. about  $22^{\circ} 27'$  S., long.  $151^{\circ} 21'$  W.; it was discovered by Cook on 14th August, 1769, during his first voyage. It is between 6 and 7 miles long North and South, 3 miles wide at the northern part, and volcanic in appearance; the mountains attain a height of 1,300 feet, the lower parts being wooded.

The reef which surrounds the island is nearly contiguous to the shore. There is a small port, fit only for small craft of from 40 to 50 tons on the north-eastern part of the island, and a passage on the south-eastern side fit for boats only, in fine weather, as also the bay presently described.

Approaching the island from the northward, the most conspicuous objects are the church (a white building without a tower) and some white houses, among which is the two-storied house of the chief, in front of which is a high flagstaff.

The native inhabitants numbered, in 1892, about 360; they are stated to be Protestant, formerly under the direction of the London Missionary Society, to be good natured and intelligent, and to have some knowledge of shipbuilding and navigation.

**Supplies.**—Pigs, fowls, water, as well as vegetables and fruit in limited quantities, can be obtained.

**Anchorage.**—Near the middle of the western side of the island is Avera bay, 2 miles deep, which is a safe and convenient anchorage during the prevalent easterly winds; the bottom is first seen at about 5 cables from the surrounding reef. Sailing-vessels can easily enter this bay, and the water, though deep, is free from dangers. There is an opening through the reef at the head of this bay, practicable for row-boats in fine weather; it is marked by a post in the coral rocks, which post has to be left on the port hand in entering.

**RIMITARA**, lying 77 miles W.S.W. of Rurutu island, in lat. 22° 40' S., long. 152° 45' W., is a small island about 2 or 3 miles in diameter, and rising to a height of 315 feet in the centre. It had in 1892 a population of about 550; the principal village, Amaru, is on the eastern side. A coral reef closely surrounds the shore, through which there is a small opening on the eastern side, never accessible even to boats with an easterly wind; and two small openings on the northern side, of which the easternmost is the best. The natives say that schooners of 50 tons have been launched and sent to sea by this narrow passage. The island can, however, be approached only in favourable weather, when landing may be effected either by the northern channel or opposite the villages on the eastern and western sides, according to the direction of the wind, but not at the village at the southern end.

The natives export a small quantity of cocoanut oil and cotton, rear pigs and fowls, and cultivate vegetables and fruit, all of which may be obtained at reasonable prices if the weather admits of communication with the shore.

**HULL ISLANDS or ÎLE MARIA.**—These, the westernmost of the Tubuai islands, first reported by Mr. Sands, of the whaler *Benjamin Tucker*, in October 1845, and formerly called Sands island, but now named by the French *île Maria*, is a group of four small islands on a coral reef of triangular form, with its longest side N.W. and S.E., along which are three islands within a distance of about 3 miles, the fourth island lying at the apex of the triangle 2 miles N.E. of the centre one. The highest of the islands is 66 feet in height, and all are more or less wooded; they are not inhabited.

The reef surrounding the islands appears to have no opening, and within the reef the water is shallow, the bottom being distinctly seen from outside. The north-western point of the group is in lat. 21° 49' S., long. 154° 43' W.

Landing is generally impracticable on account of the surf.

## COOK ISLANDS.\*

This group, which lies scattered over a considerable space, the nearest islands about 180 miles W. by N. from the nearest of the Tubuai islands, was thus named by Admiral Krusenstern. There are nine or ten separate islands; the greater number were discovered by Cook, and the whole group is under the protection of Great Britain, under the style of the Cook island Federation.

The Cook islands seldom suffer from epidemics, and are generally healthy. The natives of all this group are much darker than the Tahitians, and many of the islanders have a Mongolian type of face; they have been converted to the Protestant form of Christianity, and resident missionaries of the London Missionary Society are stationed at Rarotonga, Mangaia, and Aitutaki. The people of the last-named island speak the same language as those of Rarotonga. The houses are built of coral, whitewashed, with thatched roofs, and present a very picturesque appearance from the sea.

The same date of the Calendar as that in the Australian Colonies is observed.

**Winds.**—These islands being so near the limit of the trade winds, steady south-easterly breezes must not be expected; but they are most frequent between May and October, both included; during the remainder of the year, S.W. and westerly winds, which often blow as gales for several days in succession, are frequent, and cause a heavy surf on the western or usually lee sides of the islands.

Hurricanes occur about once in seven years, but these storms are very local; the worst months are from December to March inclusive. Commencing generally at from N.W. to North, and ending at S.E., they do immense damage.

**Currents.**—In the vicinity of this group the current will generally be found setting to the westward, at the rate of about half a mile an hour, but much influenced in rate and direction by the force and direction of the wind.

**MANGAIA**, the southernmost island of the group, was discovered by Cook on his third voyage, 30th March 1777, and is situated in lat.  $21^{\circ} 55'$  S., long.  $157^{\circ} 56'$  W. It is of volcanic origin, about 30 miles in circumference, and otherwise differs from most of the South Pacific islands. It is 656 feet high, and at a distance appears almost flat; there is a fringing reef all round, extending from 50 yards to 2 cables from the shore, and about 2 feet above high-water mark, but

---

\* See Admiralty charts:—Pacific ocean, general, No. 2,683; Pacific Ocean, S.E. sheet, No. 783.

there is no passage through it. Ships can approach the edge of the reef to within one cable, as there are no outlying dangers, but there is no anchorage, the reef being steep-to everywhere.

The method of communicating with the shore is as follows:—Boats anchor outside the reef, on a ledge on the western side of the island off the principal village, Oneroa, and large canoes come off for passengers, &c.; the natives then look out for the rise of the swell and land the canoes on the reef, jump out quickly, and drag the canoe across the reef to land before the receding sea can sweep it back into deep water. There is always, even in the finest weather, some swell on, and it is not always safe to attempt a landing; few accidents, however, occur. With westerly winds it is best to land on the eastern side of the island about 3 miles from the northern point; the places may be known by a cutting in the cliffs and by a corrugated iron building and three huts on the shore. The method of landing is the same as at Oneroa.

The climate is good and the island healthy. The population numbers about 2,000, of whom half live near the mission station of Oneroa, which is very conspicuous from a new church having been erected on the green facing the sea; the remainder are distributed between two other villages, Ivirua and Tamarua, each of which has its church and school; they are intelligent and industrious, and are governed by a chief residing at Oneroa.

**Communications.**—About a dozen schooners visit the island annually from New Zealand, Tahiti, and Rarotonga, and export coffee, cotton, copra, and tobacco.

**Supplies.**—Pigs, poultry, yams, sweet potatoes, and pine apples can be obtained, but it is necessary to go 3 miles inland for water. Horses are in use on this island.

**RAROTONGA.\***—This island, lying about 100 miles W. by N of Mangaia, is 6 miles in length,  $3\frac{1}{2}$  miles wide, and is surrounded by a fringing reef, which, however, is not so entirely without breaks as at Mangaia, nor is it steep-to. The principal settlement, Avarua, is on the northern side, where are the two harbours presently described. On the eastern side are the villages Matavera and Ngatangua; at the latter is a little harbour where small vessels are built, and where there is good landing in westerly winds. On the southern side is the village of Tatikaveka; and, on the western side, Arorangi. In appearance the island somewhat resembles Tahiti, with the mountains rising up into pinnacles and fantastic peaks, and covered with vegetation. The highest peak, near the middle of the island, and one third the length from the eastern end, is mount Te Atu Kura, 2,920 feet above the sea. The

---

\* See chart, No. 783; also plan on sheet of plans, No. 1,264.

observation spot on Tekaræ point, on the northern side of the island, is in lat.  $21^{\circ} 11' 35''$  S., long.  $159^{\circ} 47'$  W.

**Anchorage.**—There is anchorage off Avarua, in from 10 to 15 fathoms, about 2 cables outside the reefs; it is protected from south-easterly winds by the N.E. point and the reef off it, but should the wind shift to the northward a swell sets in, and it would not be safe except for a steam-vessel with steam ready.

Large vessels standing off and on should be careful not to get too close inshore, especially westward of Avarua, as there is a considerable set on-shore, and several ships have been wrecked, there being deep water and no anchorage close to the edge of the reef in that part, though as a rule there are anchorage depths around the island.

**Products.—Trade.**—Coffee of good quality, and South Sea island cotton are grown, about 250 acres being under cultivation for the latter plant. A ginning machine is erected, where the cotton from the Hervey group is sent previous to its being shipped off either to New Zealand or Tahiti. The yearly imports are valued at about £12,000, consisting of cloth, hardware, provisions, lumber, and iron, etc.; the exports, valued at £15,000, consist of copra, coffee, lime juice, cotton, oranges, pine-apples, etc. The island is in fortnightly communication with Auckland, and telegrams have been received from London in 12 days. About 40 sailing vessels and 30 steamers call annually, including a small local steamer trading amongst the islands.

**The Deputy Commissioner**, the chief authority of the whole Cook island confederation, resides at Avatiu, in Rarotonga. The London Missionary Society has an institution at Avarua for the education of native missionaries, many of whom have been sent to the outlying stations at Manahiki, Rakahanga, and Puka Puka islands, lying to the northward of this group. In 1890 the population of the island numbered about 2,000, including about 50 Europeans.

**Avatiu harbour\*** is very confined, but is sheltered from all winds except those from the northward; even with those winds the danger is not from the sea raised by the wind, but from the rapid current which sets out, caused by the rush of water over the reef on either side of the entrance.

H.M. sloop *Cormorant*, of 1,130 tons, went into this harbour in November, 1887, and secured head and stern by chains laid to anchors on the reef, and kept there for that purpose. When going in, the vessel's bow should be run close to the weather side, whichever it may happen to be, the stern swung round and secured as above mentioned; by this means, the vessel lies head out, and can slip everything on approach of bad weather,

\* See chart, No. 783; also plan on No. 1,264.

and proceed to sea. The local trading steam-vessel always secures in this manner, but there is only room for one such vessel.

The harbour is considered safe from April to November; after that, northerly gales are apt to spring up suddenly, when a vessel might have to go to sea at night.

When anchoring in the roads, care must be taken to let go the anchor directly the right depth is obtained: the water shoals suddenly, and the vessel is liable to be backed into very deep water. In entering the harbour, Lieut. Johnson, H.M.S. *Goldfinch*, reported in July 1891 that there is a small coral patch with 2 fathoms over it at low water just off the western side of the entrance, the position of which was not ascertained, but which vessels must be careful to avoid.

**Supplies.**—Fresh provisions, &c. can be obtained at moderate prices, also fowls and turkeys.

**Coals.**—A pier 300 feet long has been constructed, on which is a tramway to facilitate coaling, loading, &c. In June 1889, H.M.S. *Cormorant* shipped 70 tons of coal in two days, by means of the ship's boats in a rough sea; no lighter was then available. In 1897, several small lighters capable of holding about 3 tons each, as also two steam launches, were maintained in Avarua harbour by the Union Steamship Company of New Zealand. In August of that year H.M.S. *Goldfinch* coaled from the monthly steamer at the anchorage by means of these lighters, and in a rough sea shipped 70 tons in 11½ hours. About 200 tons is usually in stock, at about 3*l.* per ton, and coaling is interrupted by strong winds from East through North to N.W.

**Avarua harbour**, about 5 cables eastward of Avatiu, has an evil reputation, but the Union Steamship Company of New Zealand have constructed a pier within it on which is a tramway and storehouses; on it two small red leading lights are shown when the monthly steamer is expected, and in line they guide her to the anchorage outside the harbour, and also lead directly into the harbour to the jetty. Moorings are laid in the harbour for small craft, but no vessel above 100 tons can enter.

**Water** may be obtained from a stream flowing into Avarua harbour.

**MAUKI ISLAND**, the easternmost of the Cook group, is low and wooded, about 2 miles in diameter and nearly circular, the tops of the trees being estimated at 120 feet above the sea, which render it visible from the masthead from a distance of about 17 miles.

Mauki island is reported to have no anchorage, but canoes come off in fine weather to communicate with passing ships. The fringing reef does not appear to extend beyond one mile from the shore; the western side is

clear of dangers and may be approached to within 2 or 3 cables. The landing place is on the western side, close to a flagstaff and immediately below a house almost hidden by trees.

The large clump on the southern part is in lat.  $20^{\circ} 7' S.$ , long.  $157^{\circ} 22' W.$  Lieut. Johnson, H.M.S. *Goldfinch*, in May 1891, considered that this longitude is approximately 8' too far westward.

The only village, Nukua'o, is more than one mile from the landing place, and the church is a fine specimen of native work. The natives are a fine race, pleasant in face and merry in disposition; they number about 400. The island produces copra and cotton for export, for which a schooner from Auckland calls at regular intervals.

**MITIÉRO ISLAND**, which lies about 22 miles N.W. by W. of Mauki island, is small and covered with verdure; near the centre is a clump of trees the tops of which are 92 feet above the sea, visible from the masthead from a distance of about 16 miles.

It is surrounded by a barrier reef, outside of which are, apparently, no dangers; and there is no anchorage. On the western side is a hut and flagstaff among the cocoanut trees which marks the landing place through the reef, but the surf is too heavy to admit of ships' boats using it.

In 1888, the population numbered 275, chiefly resident in the village of Nukutere. A small quantity of copra and cotton is exported. A hurricane visited the island in November 1890, destroying many huts and cocoanut trees, but it does not appear to have been experienced in other islands of the Cook group.

The white tomb (a conspicuous object on the western coast of the island) is in lat.  $19^{\circ} 49' S.$ , long.  $157^{\circ} 43' W.$

**ATIU**,\* or Vatiu island, discovered by Cook on 31st March 1777, is about 20 miles in circumference; the highest point, 394 feet above the sea, is in lat.  $19^{\circ} 59' S.$ , long.  $158^{\circ} 6' W.$ , and lies about 22 miles West of Mauki. The formation of this island much resembles Mangaia, and a reef closely fringes the shore, extending in no place more than 5 cables; there are no outlying dangers.

The northern side presents a bold rocky cliff shore about 30 feet high, intersected by small sandy bays between the rocky heads. On the cliff above these bays some roads may be seen cut through the jungle into the interior. There are two landing places for canoes on the western side, one marked by a flagstaff; the other, about 2 miles farther to the northward, marked by a white tomb. On the eastern side there are also two landing places, with westerly winds, both indicated by sandy beaches, one

---

\* See chart, No. 783; also plans on No. 1,264.



just southward of the N.E. point of the island, the other southward of the East point; the eastern landing places are very difficult.

The village of Natikitea, with its church, shows conspicuously on the top of the ridge, about  $1\frac{1}{2}$  miles from the principal western landing place. There are two other villages, viz., Natipa in the North, and Niaurau in the South. The population of the island is about 800.

A considerable number of vessels call here, and temporary anchorage for small craft may be obtained on a small patch, in 16 fathoms, on the northern side of the island, but no vessel should remain here at night. Copra is the principal export, but cocoanuts, coffee, cotton, bananas, limes, pine-apples, and oranges, are grown also.

**TAKUTEA**,\* also called Fenua Iti, about 11 miles N.W. of Atiu, is a small uninhabited island about 3 miles in circumference, with a white coral sand beach protected by a fringing reef; it is well wooded with cocoanut palms and other trees, the tops of which are about 80 feet high, and render it visible as far as the landing place at Atiu. It is reported to be without water.

Heavy breakers extend  $1\frac{1}{4}$  miles from the south-eastern point. There is no anchorage, and the only place where landing appears practicable is on the northern side, where there is a barrier reef close to a few ruined huts.

The centre of the island is in lat.  $19^{\circ} 49' S.$ , long.  $158^{\circ} 16' W.$

**HERVEY ISLANDS**\* were discovered by Cook in 1773, and named by him after Captain Hervey, one of the Lords of the Admiralty and afterwards Earl of Bristol. They are about 45 miles N.W. by W. of Takutea, and consist of two small low islands named Manuai and Auotu lying  $1\frac{1}{4}$  miles N.E. and S.W. of each other, having a lagoon between them, and being surrounded by a coral reef through which there is no passage. The greater part of the lagoon is occupied by coral reefs with deep water in parts between them.

These islands are well wooded, the tops of the trees being about 60 feet, above the sea. The settlement is on the north-western side of Manuai, the south-western island, where there is landing through a small and shallow passage in the reef. There are about 25 inhabitants, whose occupation is collecting and exporting copra for the Chief of Aitutaki, who claims these islands. A few fowls and pigs may be obtained.

Although there is no safe anchorage, a vessel requiring urgently to anchor might do so within 50 yards of the reef, with a kedge well out from the stern to keep her from tailing on the reef, but it is obvious that the possibility of this would depend on the state of wind and weather at the time.

The settlement is in lat.  $19^{\circ} 14' S.$ , long.  $158^{\circ} 43' W.$  approximately.

---

\* See chart, No. 783; also plans on No. 1,264.

**AITUTAKI**,\* the north-western island of the Cook group, lies about 55 miles W. by N. of the Hervey islands, and was discovered on 11th April 1798, by Captain Bligh, of the *Bounty*, a few days before the mutiny; it is 4 miles long, North and South, and is in the form of a ridge sloping gradually from North to South. The highest peak, bare, except for a few cocoanut trees, and 450 feet above the sea, is near the northern end; and on the N.W. side is Bluff peak, with a remarkably steep rocky cliff 200 feet high, facing the sea; the extreme northern end is low and swampy. In 1892, the population was about 1,500, and was said to be decreasing at the rate of about 40 per annum. The island is well watered, thickly wooded, and could easily support a much larger population, the climate being healthy; the people are hospitable and well-disposed.

The island has its own form of government under the authority of the Deputy Commissioner at Rarotonga, by whom also the Post Office and Custom-house authorities are appointed.

Aitutaki has at its northern end only a fringing reef; the island resting its northern end, in fact, on a reef which on both sides and to the southward quits the shore of the island and becomes a barrier reef, through which there are only boat passages, the principal one being opposite the mission station at Arutunga, on the western side of the island.

The barrier reef is in the form of a triangle, and extends from the northern end of the island, 7 miles to the south-eastward,  $6\frac{1}{2}$  miles to the south-westward, and its southern end or base is  $6\frac{1}{2}$  miles long, W. by N. and E. by S. On the outer edge are eight islands, covered with trees, from 20 to 60 feet high, and six low sand cays upon which the sea breaks heavily.

The small wooded island, Maina, 20 feet high, stands on the western elbow of the barrier reef, and similarly the small island, Motikitiv, with several larger ones close adjacent, at the south-eastern elbow. None but the main island of Aitutaki are inhabited.

The lagoon within the barrier reef is thickly studded with rocky coral heads, amongst which are depths of from  $3\frac{1}{2}$  to  $5\frac{1}{2}$  fathoms.

Outside the reef are no outlying shoals, and the edge is well marked by breakers and by rocks above water.

**Anchorage.**—The only anchorage is off the boat passage on the western side off Arutunga, with the church bearing S.E.  $\frac{1}{4}$  E. With the anchor in 15 fathoms and 3 shackles of cable out, there are only 120 yards of swinging room. A steamer with steam ready could lie here from April to November, the season of easterly winds. H.M.S. *Champion* remained here 8 days in June 1892, and only once tailed towards the reef.

Sailing vessels never attempt an anchorage, but always stand off and on.

---

\* See chart, No. 783; also plan on No. 1,264.

**Boat passage.**—There is a double boat passage at Arutunga, the entrances being about 2 cables apart; the north-eastern is the true passage, and is at first from 26 to 30 yards wide for about 150 yards, with a depth of 3 fathoms; it then shoals to 4 feet for another 100 yards; from thence a channel not more than a boat's length wide, with from 2 to 6 feet water, leads up to the pier, a rough stone structure with only 2 feet at its head. A strong stream always runs out through the passage, sometimes as much as 5 knots.

The natives state that formerly there was sufficient water inside for schooners to lie at anchor, where now there are only 3 feet.

**Tides.**—The extreme range of tide is only about 2 feet; and the rise at neaps is not more than one foot. It is high water, full and change, at about 8 hours, but the tide depends greatly on the wind.

The missionary establishment at Arutunga consists of two white buildings, the church and school-house. One white missionary and four white traders were resident on the island in 1892.

**Supplies—Trade, &c.**—Pigs, fowls, fruit, &c., may be obtained at moderate prices, and there are a few cattle of a small but good looking breed on the island. Water may be obtained at the pier. The principal exports are copra, cotton, arrowroot, bêche de mer, coffee, and oranges; about 100 tons of various goods are imported.

**Wind and Weather.**—From January to April is the rainy season, when also hurricanes may be expected. From April to November, easterly winds prevail. After November, north-westerly winds may be expected.

The observation spot near the inner end of the pier at Arutunga is in lat.  $18^{\circ} 52' 32''$  S., long.  $159^{\circ} 46' 30''$  W.

**PALMERSTON ISLAND.\***—This island, lying W. by N. about 200 miles from Aitutaki, was so named in honour of Lord Palmerston, First Lord of the Admiralty; it was discovered by Cook on the 16th June 1774. It consists, in fact, of eight sandy islets on a coral reef  $4\frac{1}{2}$  miles in extent North and South by  $2\frac{1}{2}$  miles East and West, enclosing a lagoon; of the islets, those on the southern half are covered with shrubs and palms, but the north-eastern islets, being low and without vegetation, are very dangerous at night.

In 1891, Palmerston island had been in the occupation of Mr. Marston, a British subject, for 30 years. It was further leased to him for 21 years from the 1st January 1892 by order of the High Commissioner for the Western Pacific.

The centre is in lat.  $18^{\circ} 4'$  S., long.  $163^{\circ} 10'$  W. (approximate).

---

\* See chart, No. 783; also plan of Palmerston island, on sheet No. 1,176.

When visited by H.M.S. *Goldfinch* in 1891, the total population amounted to 35, all of whom lived on the south-western islet. Nothing in the way of supplies could be obtained except cocoanuts and fish.

**Anchorage.—Passes.**—Northward of the westernmost island there is a narrow boat passage and about one mile north-eastward of it is a wider passage, said to have about 8 feet water in it. There is anchorage in 9 fathoms, coral, about 100 yards from the reef abreast of the southern boat passage. Small schooners occasionally visit the island for copra, mooring off the southern boat passage.

This island or group of islets was visited by a severe storm in December 1883, which destroyed all the cocoanuts. The inhabitants report that heavy gales occur nearly every year, generally in January and February, blowing from N.E. and East, lasting from 24 to 36 hours, and as a rule not shifting from that quarter. The coconut trees being all much bent to the westward tends to confirm this.

Nearly 300 miles westward and W.S.W. from Palmerston island are the Antiope and Beveridge reefs, which may be considered as outlying reefs of the Friendly islands, and will be found described in *Pacific Islands*, Vol. II.

---

## CHAPTER III.

## SOCIETY ISLANDS.

---

 VARIATION IN 1900.

Tahiti - - - 8° 30' E.

---

**SOCIETY ISLANDS.\*—General information.**—This important double group of islands consists of the celebrated island Tahiti and several smaller islands in the south-eastern or Windward group, and of Huahine, Raiatea and other islands in the north-western or Leeward group. There is but little doubt that Tahiti was first seen by Quiros in 1606, but, like many other Spanish discoveries, it was unknown or unnoticed by the rest of the world, so that when the *Dolphin*, Captain Wallis (sent by George III. to make discoveries in the South Seas), reached it on June 19th, 1767, it was supposed to be a new discovery, and named King George Island.

Captain Wallis sailed along the eastern side and anchored off the north-eastern shore. On the 23rd he discovered Matavai bay, and, in passing it, struck on the Dolphin shoal; the ship was, however, got off safely and anchored in the bay, when Lieutenant Furneaux landed and took formal possession in the name of George III. by hoisting a flag. On April 2nd, 1768, M. de Bougainville visited the island in the *Boudeuse* frigate and a store ship, leaving on the 14th, and naming it Nouvelle Cythère.

The next visit was the most important, as it made the world more intimately acquainted with the group than did the former ones, besides filling important vacancies in science.

It had been recommended that the rare occurrence of the transit of Venus across the sun's disc should be observed at points as far apart as possible; for this purpose. Lieutenant James Cook (with an efficient staff of scientific observers), was sent in the *Endeavour* to make the necessary observations. They arrived at Matavai bay on April 12th, 1769, and on the 3rd of June following, the transit was observed near the North point of the island, which thus became one of the best determined positions in the Western hemisphere and was named Venus point. Cook surveyed

---

\* See Admiralty charts :—Pacific ocean, general, No. 2,683. Pacific ocean, S.E. sheet, No. 783. Tuamotu or Low Archipelago, No. 767. Tahiti and Murea, No. 1,382. Society islands, western group, No. 1,060. Harbours in Society islands, No. 526. Anchorages in the Society islands, No. 1,107. Bora Bora, No. 1,428.

the chief island (then spelt Otaheité), and discovered the north-western group, giving them the name Society islands; the others, including Tahiti, he named the Georgian islands. The name Society islands now applies to and includes both groups, but by those trading among them they are distinguished as the Windward and Leeward groups.

In 1772, the Spanish government despatched an expedition to Tahiti under Don Domingo Bonecheo; on returning, his report caused an attempt at colonisation to be made, and in 1774 Bonecheo was again sent with missionaries and other means to establish a settlement.

Between these visits of the Spaniards, Cook had, in company with Captain Furneaux, in the *Resolution* and *Endeavour*, again visited Tahiti and heard of the Spaniards' visit, he also visited it in his last voyage in 1777.

Subsequent events concerning the island are generally known; eleven years passed without any intercourse with Europe, when Lieutenant Bligh, in command of the *Bounty*, having been commissioned by George III. to transport breadfruit trees to the British West Indies, arrived at Matavai bay on October 26th, 1788. The subsequent mutiny and return of the mutineers to Tahiti on June 6th, 1789, and again on September 22nd, 1789, is a matter of history. See page 107; on Pitcairn island.

The *Pandora* sloop, Captain Edwards, sent in search of the *Bounty* and her mutineers, arrived at Tahiti on March 23rd, 1791, and took away those who had remained, fourteen in number. The *Pandora* was, however, wrecked near Torres strait, when returning to England.

Vancouver also visited Tahiti in 1791; thus, most of the great voyagers to whom we owe our knowledge of the Pacific have made this point.

The London Missionary Society sent missionaries to Tahiti in 1797 to convert the aboriginal inhabitants to Christianity, and after twenty years their efforts were crowned with success, the whole population renouncing paganism. This society still has mission stations at Huaheine, Raieatea, Bora Bora, and Maupiti, and the great majority of the inhabitants are Protestants. In Tahiti and Murea there are about 2,000 Roman Catholics.

The most prominent chief, Pomaré, who supported the missionaries, soon acquired a marked ascendancy over the other chiefs, and he was eventually declared king of the Society islands and their dependencies as Pomaré I. He died in 1803.

His son, Pomaré II., after several wars succeeded in thoroughly establishing himself, but died comparatively young, in 1821, and was succeeded by Pomaré III., a child only one year old, who died when only seven. He was succeeded by the celebrated queen, Pomaré IV., who reigned actually for many years, and nominally until her death in 1877.

On that event occurring, she was succeeded by her son Pomaré V., destined to be the last king of these islands.

In 1842, on account of affronts to and the expulsion of French missionaries, the frigate *La Venus*, under Rear-Admiral Du Petit Thouars, obliged Queen Pomaré to sign a treaty allowing liberty to all French subjects; and in 1844 Captain Bruat, in the presence of a powerful fleet, landed a strong force, hauled down Queen Pomaré's standard, and hoisted the French flag, taking possession of the island in the name of Louis Philippe, king of France. Thenceforth, a French protectorate over the Windward group existed until June 1880. In that year the kingdom of Pomaré V. and its dependencies were formally annexed to France, and the king ceased to reign. In 1887, by a convention with the English government, the Leeward group was also assigned to France, and was taken possession of by that government in March 1888.

**Position, &c.**—The two groups forming the Society islands are all included between latitudes  $15^{\circ} 40'$  and  $17^{\circ} 55'$  S., and longitudes  $148^{\circ}$  and  $154^{\circ} 50'$  W. The Windward group consists of the islands Maitea, Tahiti, Eimeo or Murea, Tetiaroa, and Tubuai Manu; the Leeward group of Raiatea, Huaheine, Tahaa, Bora Bora, Maupiti, and the islets Motu-Iti or Tubai, Mopelá, Fenua Ua, and Bellingshausen. All these islands, except Tetiaroa and the islets of the West, consist of high volcanic mountains, surrounded by coral barrier reefs; the exceptions being of coral formation only.

The natives of the Society islands are all known as Tahitians, and are renowned for their beauty and vigour; they are of a yellowish olive complexion, dark in those exposed to the air and sea, but very clear and fair, especially amongst females, of the higher classes, where not infrequently the general traits approach very nearly to European form and colour. Indeed, it has been suggested, and is not improbable, that in the two hundred years which elapsed after Magellan crossed the Pacific, and before Wallis re-discovered these islands, that they had been the resort of many Spanish adventurers from the mainland of America, who had intermarried, lived, and died there, and consequently that there was a very marked intermingling of European blood with the native races.

**Climate.**—The climate of the Society islands is hot and damp at all seasons; but on account of the latitude being well to the southward the difference of temperature between summer and winter is very perceptible, especially at night. The climate suits Europeans very well, and they do not suffer from the maladies common to the northern races in hot countries. Sunstroke is not more frequent than in Europe.

---

See chart, No. 767.

The maximum temperature by day rarely exceeds  $94^{\circ}$  (Fahr.) during the hot season, in January, and seldom falls below  $82^{\circ}$  in June; the average is about  $86^{\circ}$ . The minimum temperature at night falls but little below  $81^{\circ}$  in the hot season; but in the cool season it often falls to  $70^{\circ}$  and sometimes to  $63^{\circ}$ .

**Winds.**—By their latitude, the Society islands are within the limits of the S.E. trades, and at all times of the year the wind has a tendency to blow from the eastward, often remaining for long periods between East and S.E., or East and N.E.

Various causes, however, disturb the regularity of the easterly winds, the principal apparently being the vicinity of the Tuamotu archipelago; see also page 10. When, however, the trade is strong and well established, it blows across these atolls and continues its course to the Society islands; some violent squalls, peculiar to the Tuamotus, being the only evidence of the struggle. If the trade wind happens to be light in the region eastward of the Tuamotus, it appears to be stopped altogether by these islands; the calm which results tends to increase the temperature of the lagoons and the consequent upward movement of the air, and cold masses of air from southern regions naturally tend to fill up the vacuum.

Thus, at Tahiti, after a day or two of calm, the breeze springs up from the S.W., carrying masses of cold air towards the Tuamotus. This cold air penetrating into the hot and moist tropical regions, induces an abundant condensation, a rainy season, and squalls.

During May, June, July and August, the sun is well to the northward, and its action towards heating the water of the lagoons is so much the less powerful since the general temperature is at its minimum; at the same time the S.E. trade is at its full strength blowing almost without interruption, and the Tuamotus do not cause it to vary more than between S.E. and E.N.E. When from the S.E. it is strong and squally, becoming lighter as it shifts to East or E.N.E., and returning to the S.E. after an interval of calm.

These periods last from one to two weeks, separated by a day or two of calm, and it is seldom that the wind blows from the westward during this season; but, in every such case, a westerly wind is sure to be weak and of short duration.

As the sun moves to the southward again, its effect in heating the Tuamotus increases, the trade loses its strength, shifting to E.N.E. and sometimes to N.E. Then, westward of the Tuamotus, the shifting of the wind is more marked, the periods of the trade of shorter duration, calms more persistent, and winds from the westward more frequent and stronger; and at last, during the months of December, January, February, March,



and April, the southern summer, the trade wind becomes very weak. The heat being then at its height over the Tuamotus, the evaporation of the lagoons attains its greatest intensity, so that during this season the Society islands are nearly always subject to variable winds; and breezes, sometimes fresh from the westward, alternate with calms, storms, and returns of the trade.

**Hurricanes.**—Between the months of December and March this part of the Pacific ocean is liable to be traversed by cyclonic storms, which sometimes attain, though rarely, the strength of the cyclones in the China sea and Indian ocean. *See also page 11.*

There is no record of the centre of one of these storms passing over Tahiti, and probably the high mountains divert their course northward or southward of it, as they occasionally pass over the western islands of the Tuamotu archipelago, as also to the southward between Tubuai and Tahiti. The cyclone of September 1877, which ravaged the islands of Anaa and Kaukura, was one of the most violent on record.

To an observer at Tahiti the passing of one of these storms, in accordance with the well known laws, presents the following appearances:—Should the centre be passing northward of the island, the wind begins from S.E. or East and shifts to the N.E. like the trade wind; but the falling of the barometer and the threatening and squally appearance of the weather foretell the nature of the coming storm. The wind freshens as it shifts to the North and N.W., and drops as it becomes more westerly and the storm field recedes to the westward.

The sea in this case is very heavy on the northern side of the island, and especially in the pass at Papiet . In this roadstead, the wind comes down the mountains in violent squalls, with intervals of calm accompanied by torrents of rain.

Should the centre be passing southward of the island, the wind commences at S.W., increasing in strength as it shifts to the westward, begins to drop at N.W., and dies away between N.W. and North; the sea is also very heavy on the southern side of the island.

These cyclones as they pass westward, either northward or southward of Tahiti, give place to thunderstorms and heavy rains all over the island, but especially at Papiet . From this is derived the name of *rainy season* given to the summer months when they are most frequent; they may, however, occur with greater or less violence all the year round.

In ordinary weather, there is generally much more swell on the southern and south-western coasts of these islands than on the eastern coast, though that is exposed to the most common wind; but on the north-western side there is generally the least sea. From these facts the mariner can form a

very fair estimate, where there are many passes through a barrier reef, as to which is likely to have the least sea.

**Currents.**—The current among the Society islands is not very regular; but, on clearing the coast, one can generally count upon finding the current setting with the prevailing wind, and at a rate varying from 12 to 20 miles a day, according to the strength of the breeze. Easterly winds being the most frequent, the general set of the current is westward.

**Tides.**—At Papieté, high water takes place every day between noon and 2 p.m. This appears to be peculiar to this locality, and is caused by the water thrown over the barrier reef by the sea breeze. Everywhere else among the Society islands, it is high water, full and change, at noon, springs rise  $1\frac{1}{2}$  feet.

**Beaconage.**—The French uniform system, as given at page 19, prevails amongst the Society islands.

**MAITEA**, the easternmost of the Society group, also called Mehetia island, is in lat.  $17^{\circ} 53'$  S., long.  $148^{\circ} 5'$  W., is 1,427 feet high, about 7 miles in diameter, and lies E.  $\frac{1}{2}$  S. about 60 miles from the eastern extreme of the Taïarapu peninsula of Tahiti. From its great height it may be seen 60 miles distant in clear weather.

The northern side is remarkably steep; on the southern side the declivity is more gradual. On the eastern side cocoanut and other trees abound; and near the eastern extreme are two remarkable rocks, and a reef with no pass through it extends eastward from them about  $1\frac{1}{2}$  miles. Breakers are reported to have been seen one mile from the south-western extreme.

The only safe landing place is on the south-eastern side opposite the native huts, at the end of a pathway leading to the village; even here great caution should be observed, as there are numerous rocks, and it is better to get native assistance before attempting it.

**Supplies.**—Pigs, fowls, and fruit may be obtained.

**TAHITI.\***—This, the most important island of the group (formerly called Otaheite), is 33 miles in length N.W. and S.E., and is formed by two ranges of high mountainous land, connected by the low isthmus of Taravao, about  $1\frac{1}{4}$  miles in width. Of these two peninsulas, the larger is named Tahiti, the south-eastern and smaller, Taïarapu; both peninsulas are included in the general name of Tahiti when speaking of the island as a whole.

---

\* See Admiralty chart:—Tahiti and Murea, No. 1,382; scale,  $m = 0\cdot5$  of an inch. also North coast of Tahiti, No. 1,158; scale,  $m = 3\cdot99$  inches.

From a low and generally very narrow margin of sea coast, the land rises to great heights at both extremes of the island, and some highly fertile valleys intersect the ranges in different parts.

The highest mountain in Tahiti, named Orohena, is 7,321 feet in height, and several others vary from 3,000 to 6,000 feet; from them, ridges diverge to all parts of the coast. The highest mountain in Tairapu, mount Roniu, attains a height of 4,341 feet. An excellent road known as Broom road, extends all round the island.

The mountains are frequently enveloped in clouds, so that caution is necessary when making the land at night, and if coming from North or East, the light on Venus point should be sighted before closing with the coast. In clear weather, from the great height of the land, Tahiti may be seen from 80 to 90 miles distant.

A barrier coral reef with numerous passes encircles the island at a distance of from one to 2 miles; within it are several good harbours, the principal being Papieté, on the north-western side of the island.

**Products.**—All the productions of tropical countries grow well in the soil of Tahiti, and with but little cultivation; it produces cotton of good quality, cocoanuts from which copra is made, sugar, coffee and vanilla. The bread-fruit and a species of banana are the staple food of the natives; orange and guava trees form forests; the mango, recently imported, the banana, and all the fruits and vegetables of the tropics flourish in abundance; and for several years some European vegetables have been grown as well.

Horses of a small but excellent breed are numerous and cheap; cattle are few in number; sheep and goats are numerous; pigs and poultry in great abundance; indeed many of these latter, as well as dogs, are found in a wild state in the mountains.

The only hurtful animals in the island are centipedes and scorpions which are common enough in European houses when constructed of wood. The sting of these creatures, if neglected, provokes a dangerous swelling and causes fever; this may be almost entirely prevented by at once rubbing the wounded part with ammonia, or even simply with the juice of the citron.

**Communications.**—There is a monthly postal service between Tahiti and San Francisco, carried on by sailing schooners, fitted for carrying passengers. These vessels leave San Francisco on the first of every month, calling at the Marquesas on an average in 24 days, and arriving at Tahiti on about the thirtieth day. They leave Tahiti again on the 12th of each month and take about 32 days to return to San Francisco without touching anywhere. There is a four-weekly service between

Auckland and Tahiti by a passenger steamer belonging to the Union S.S. Co. of New Zealand; also monthly communication with Auckland by a small steam-vessel belonging to Messrs. Donald and Edinburgh of that place; she leaves Auckland about the 19th of each month, calls at Tahiti about the 30th, leaves on the return journey on the following day, and, calling at Raratonga *en route*, arrives at Auckland about the 11th.

There is also an inter-island steam service by the Union S.S. Co. of New Zealand, but under the French flag, to keep up communication between Tahiti and its dependencies.

**Trade, &c.**—The currency in which the trade of Tahiti, and indeed of these islands generally, is conducted, is the Chilian or Peruvian dollar. The principal exports are copra, mother-of-pearl shell, vanilla, cocoanuts, &c. The imports are woollen and cotton manufactured articles, groceries, ironmongery and hardware, wines, spirits, &c. The total value of imports in 1897 was 143,629*l.*, and of exports 118,458*l.* About one half of the trade is done by the United States, one third by Great Britain and her colonies, and the remainder by France, Germany, and other countries.

**Population.**—In 1892, there were 10,113 inhabitants in Tahiti, of which number 4,288 resided in the town of Papiet .

**Local Winds.**—The trade-wind proper blows from S.E. between May and August; between September and December the wind is more frequently from East; and from January to April between N.N.E. and N.N.W.

Along the coast of Tahiti the winds are modified by the high mountains of the island and by the action of land and sea breezes; the prevailing winds being from E.S.E. to E.N.E.

If the wind is from E.S.E. it divides on striking Taiarapu peninsula, the southern portion blows along the southern coast of Tahiti as far as Maraa point, when it turns from the coast and blows towards the southern point of Murea. The northern portion blows along the northern coast as far as Venus point, where it is an easterly wind; there, it leaves the Tahitian coast and blows towards the northern point of Murea.

Between Maraa and Venus points there are generally calms and local breezes which extend for a short distance into the Murea channel. The dividing line between the winds to seaward and the calm is v ry clearly marked.

Should the wind be from East or E.N.E. it strikes the N.E. coast of the Taiarapu peninsula, and the south-western coast as far as Teputo becomes becalmed, while a breeze crosses the isthmus of Taravao and blows from the eastward along the southern coast of Tahiti as far as

Maraa point, when it turns away from the coast and leaves a calm between Maraa and Faa points.

In proportion as the wind shifts to East and E.N.E. the line of demarcation on the northern side between the breeze and calm, which begins at Venus point, approaches the land again and blows along the coast as far as Fareute point, from whence it turns towards the point of the reef off Faa, leaving the roadstead at Papieté in calm.

At Papieté, land and sea breezes usually prevail, the former commencing about 8 p.m. and lasting all night until 7 a.m.; the sea breeze generally sets in about 9 a.m. and blowing from N.W. dies away about 5 p.m.

**Currents.**—Along the North coast of Tahiti, the general set of the current is to the N.W., and on the South coast to the S.E. With westerly winds the current is often reversed; in fine weather the rate of the current is about one knot an hour, but with strong winds it sometimes attains a rate of 3 knots.

**VENUS POINT**, the northern point of Tahiti, has probably had more extensive series of observations made on it than any other place in the Pacific; as has been previously stated, Cook observed the Transit of Venus here in 1769, the longitude deduced from his observations being  $149^{\circ} 26' 15''$  W.; from observations made during his second voyage, it was found to be  $149^{\circ} 28' 23''$  W., nearly identical with what Captain Beechey made it in 1826. The position as now settled is lat.  $17^{\circ} 29' 14''$  S., long.  $149^{\circ} 29' 0''$  W.

It is a long low point extending to the northward about one mile from the foot of the mountains, forming a plain completely wooded with cocoanuts, and intersected by a river which runs through the Tuauru valley.

The lighthouse stands only about 60 yards within the edge of the beach, and a church stands about 660 yards S.S.E.  $\frac{1}{4}$  E. from the lighthouse; its steeple shows above the trees and can be seen from all directions. Between the church and the lighthouse is a tamarind tree planted by Cook on his first voyage, and indicating the spot at which he observed the transit of Venus in 1769.

A reef awash extends in an arc northward, eastward, and westward of the point, about 3 cables from the beach, and there are probably shoal heads a short distance seaward of the line of breakers. On the eastern portion of this reef,  $3\frac{1}{4}$  cables E.N.E. from the lighthouse, is a small islet.

There is a boat passage alongshore between the reef and the beach.

**LIGHT.**—The lighthouse on Venus point is a circular white tower; from it is shown, at 72 feet above the sea, a *fixed white* light, visible

15 miles between the bearings W.  $\frac{1}{2}$  N. and N.E. by E.  $\frac{1}{4}$  E. In all other directions it is obscured by the land.

**MATAVAI BAY**, on the western side of Venus point, between it and Utuhaihai point, and enclosed to seaward by shoals and banks, is exposed to the swell from seaward, and when it sets in, landing in ships' boats becomes dangerous. It affords good shelter with winds from S.W. through South and East to N.N.E., but is dangerous with winds between N.W. and West, as a heavy sea then sets in. At all seasons, vessels should be prepared to leave if the wind shifts to the northward of N.E.

Separated from Venus point reef by a 12-fathoms channel about 150 yards wide, is the Dolphin bank with a least depth of 13 feet, about  $5\frac{1}{4}$  cables W.S.W. from the lighthouse.

A channel about one cable wide separates the Dolphin bank from the Toa Tea reefs, a chain of shoals extending to the S.W. for about  $1\frac{1}{4}$  miles. There are several channels through these reefs, and the depth is very irregular; on some of the coral heads there are only from 15 to 20 feet water.

The shore of Matavai bay consists of a slightly receding sandy beach, with many houses, stretching for about one mile south-westward towards and terminating in the rocky hill called mount Tahara, with a cliff face towards the sea; from thence onward to Utuhaihai point,  $1\frac{1}{4}$  miles, the coast consists of a series of small sandy bays separated by rocky points surrounded by coral reefs.

Between Toa Tea reefs and the shore a little westward of mount Tahara, is Mahoti reef, on which are depths of 2 fathoms, and a small patch of only 5 feet on its western side.

With a heavy swell from seaward there are breakers on the Dolphin bank, Mahoti reef, and some parts of Toa Tea reefs.

**Anchorage.**—In Matavai bay, anchorage may be obtained anywhere in from 8 to 16 fathoms, sand; the best is about 3 cables from the beach in 11 fathoms, with the church near Venus point bearing E.  $\frac{3}{4}$  N.

**Directions.**—When making for the anchorage with easterly winds, a sailing-vessel should pass close to the reef off Venus point, but keeping clear of the depth of 2 fathoms extending for a short distance westward of the breakers. These shoals will be cleared by steering S.  $\frac{1}{2}$  W. for the perpendicular cliff at the western extreme of mount Tahara. When the lighthouse, bearing E.  $\frac{1}{2}$  N., is in line with the North point of Motu Au, a small wooded island to the eastward, luff up quickly to S.E.  $\frac{1}{2}$  S. to avoid the Dolphin bank, and shortly afterwards as soon as the point of breakers has been passed, to S.E.  $\frac{3}{4}$  E., and anchor, as previously directed, when the church bears E.  $\frac{3}{4}$  N.

This manœuvre, which is easy when the wind is E.N.E., is more difficult with an East wind, because it is necessary to pass as close as possible to the reef off Venus point, and at the time for luffing to enter the channel, to expect a current setting along the reef towards the Dolphin shoal.

It is also possible to enter by the channel southward of this shoal, and by luffing, to come to an anchor in  $8\frac{3}{4}$  fathoms, or else to tack inside the bay in order to reach the anchorage before mentioned.

**N.W. Coast.**—Utuhaihai point is low and covered with cocoanut and iron-wood trees. The tomb of the Pomarés is situated here by the side of a church, a large white building visible from seaward. From Utuhaihai point to Fareute point, about 3 miles westward, the coast is low, the foot of the mountains receding some little distance inland, leaving between them and the sea a belt of well wooded and cultivated land, well watered by streams, and with many houses.

**PAPAWA HARBOUR.**—From off Utuhaihai point, a reef awash, and from  $3\frac{3}{4}$  to  $4\frac{1}{2}$  cables from the shore, extends to Taunoa pass, a distance of  $1\frac{1}{2}$  miles. Inside, and protected by the reef described, is a basin obstructed by banks of coral, with winding deep-water channels between them, having from 8 to 11 fathoms, sand, from 1 to  $1\frac{1}{2}$  cables wide, with a pass about half a cable wide opening into it from Matavai bay opposite Utuhaihai point; and another, very narrow, intricate, and with less than 3 fathoms water at its western entrance. This basin bears the name of Papawa harbour.

The anchorage is N.W. of the king's house, a large European building with a verandah, close to the beach and about 3 cables S.W. of Utuhaihai point.

**TAUNOA HARBOUR.**—This harbour is separated from Papawa harbour by Arahiri point.

**Taunoa pass—Beacon.**—Taunoa pass is about  $1\frac{1}{2}$  cables wide, with no dangerous bar, and clearly marked by the edges of the reef awash on either side. On the eastern side, however, rocks with only 9 feet, on which the sea sometimes breaks, extend about 150 yards N.W. from the point of the reef awash. Another rock inside the pass near the western side, about half a cable S.S.E. from the eastern point of the western reef, is marked by a red beacon with conical top-mark. Taunoa pass may be recognised from a long distance seaward, when in the right direction for entering by a remarkable rugged peak, named the Diadème, which when seen through a deep gorge bearing S.S.E.  $\frac{1}{2}$  E. leads up to the entrance; see view on chart, No. 1,158. This pass is one of the best

in Tahiti, and the breeze is more regular than at Papieté. Sailing-vessels going to Papieté often enter by Taunoa pass and use the narrow but well beacons channel inside the reefs which connects Taunoa and Papieté.

The current nearly always runs out through the pass, but is not very strong.

**Leading beacons.**—Two white pyramidal beacons stand on the shore close to the beach ; the front beacon is of open woodwork, the rear beacon of solid masonry ; kept in line on a S.E.  $\frac{1}{2}$  S. bearing they lead through the middle of the pass.

**Anchorage.**—The best anchorage in Taunoa harbour is with the two beacons in line, and Arahiri point bearing E. by N.  $\frac{3}{4}$  N. Small vessels can anchor nearer the eastern reef, where the water is smoother. The bottom is of black sand.

The anchorage in Taunoa harbour is good with easterly winds, but as the pass is wide, the swell rolls in heavily upon the sandy beach at the head of the bay. With strong N.W. winds it is a dangerous anchorage, and landing impossible from boats, even by entering the channels through the reefs on the one side or the other. It is rarely used except by vessels about to proceed through the channel, now to be described, leading to Papieté.

**Taunoa channel** connects Taunoa with Papieté harbour ; it is well beacons, having black beacons on the southern side, and red beacons on the northern side. It is very tortuous, about  $1\frac{1}{2}$  miles in length, and not to be used by a stranger without a pilot. With an easterly wind, vessels drawing as much as 19 feet can use it with safety, but long vessels experience some difficulty in making the sharp turns at the eastern end of the channel, where two banks of coral divide it into three narrow passages with depths of  $6\frac{1}{2}$  fathoms. A black beacon marks the northern point of the northern patch, and a red beacon the southern point of the southern patch ; an anchor is placed between the two beacons above water to permit of making fast a hawser.

**PAPIETÉ HARBOUR** is the most important and affords the best shelter of any harbour in the island of Tahiti ; it is enclosed between the shore and the barrier reef, through which there is only a narrow passage. The northern half is somewhat obstructed by coral reefs, but the southern part is clear of dangers. It is in many respects a convenient harbour, but is subject to calms and much hot weather in consequence of its leeward position ; the free course of the trade wind being diverted by high lands and obstructed by groves of cocoa-nut and other trees. It is about one mile in length N.E. and S.W., and 3 cables wide.



**Trade.**—The inter-island trade is carried on chiefly by small coasters of from 35 to 40 tons under the French flag. In the year 1897, 14 steamers entered the port, of which 13 were British, and one American; the total steam tonnage being 8,664 tons; the total tonnage of all classes only amounted to 25,836, being a decrease of 3,500 tons on the preceding year.

Papieté is the seat of Government of the Society islands, and the town extends from Fareute point for about one mile westward along the beach, terminating with a masked battery nearly opposite the entrance pass. There are several quays which admit of vessels of large size going alongside, and mooring buoys to assist them in doing so.

**A British Consul** and several other national Consuls are stationed at Papieté.

On approaching from seaward, the first object in the town which comes into view is the white steeple of the church, which stands about 5 cables S.E.  $\frac{1}{2}$  S. from Fareute point, and overlooks the trees by which most of the other buildings are hidden.

Immediately over the town is a bare hill, named mount Faiere, which terminates in a plateau 236 feet above the sea, on which is a 10-gun battery over which the French flag is generally hoisted. At  $1\frac{1}{2}$  cables N.N.E. of the battery is a Semaphore and signal station with flagstaff.

**Pass.—Depths.**—The entrance into Papieté harbour is a break about  $2\frac{3}{4}$  cables wide in the barrier reef, but the navigable channel is so narrowed by shallow water extending from the reefs, and especially from that on the western side, that, although improved by dredging and blasting, it is hardly more than 100 yards wide, with from  $5\frac{1}{4}$  to 7 fathoms. On the western bank, extending  $1\frac{1}{2}$  cables across the pass, and called the Bar, there are only from  $1\frac{1}{2}$  to 2 fathoms water. The sea nearly always breaks on this bank.

On the eastern side, the bank extends from the reef only half a cable into the pass, with from  $1\frac{1}{2}$  to 2 fathoms. Within the pass, the harbour opens out, and, with the exception of the reefs presently mentioned, there is a large space for anchorage with from 8 to 18 fathoms, sand and mud.

The chief danger to sailing vessels using the pass at Papieté, is that the wind may fail them suddenly, and the current, which is nearly always running out, may set them on the reef. Sailing vessels from a distance should always take a pilot to enter the harbour, as he will know how the wind is at the anchorage, which is often very different from that outside. The land breeze is more regular and steady than the sea breeze, and should be taken advantage of for leaving the port.

**Currents in Papieté pass.**—Outside the reef the current generally sets to the westward about one knot an hour, which should be borne in mind when about to enter.

Tidal streams are but little felt in Papieté harbour. The currents which prevail in the pass being due chiefly to the state of the sea upon the neighbouring reefs. The volumes of water thrown by the waves over the reef off Faa cause a current which runs out towards the pass to the N.E. and North; while the current from the water driven in over Taunoa reef runs towards the pass in a W.S.W. direction along the inside edge of the barrier reef; so that the resulting current through the pass depends on the preponderance of the one or the other of the two currents which form it.

When the sea is heavy to the southward of the harbour and slight upon the northern reef, the current from Faa is the stronger and the current through the pass is more northerly; this generally is the case in the fine season. But when the swell comes from the North and breaks heavily upon Taunoa reef, the westerly current prevails and the current through the pass is more westerly. Under these latter circumstances, the pass of Papieté becomes very dangerous, as the sea is heavy, and the current, sometimes attaining a rate of 4 or 5 knots, sets right upon the bar.\*

**Leading marks.**—Two white obelisks, about 40 feet high, for leading through the entrance, are in line on a S. by E.  $\frac{1}{2}$  E. bearing, and are placed, one on the eastern edge of Soaotoi reef, which reef is separated from the inner part of the barrier reef on the western side by a narrow but deep channel; the other beacon is on the beach opposite.

**Lights.**—Two wooden structures, 142 yards apart, and in line on a S.E.  $\frac{1}{2}$  S. bearing, on which *fixed red* lights are exhibited, are thus placed: the Front light is shown from a white pyramid on the prison wall at Tipareui brook entrance, at 33 feet above high water, and is visible 12 miles † from S. 22° W. to N. 82° E. The Rear light is shown from a white wooden tower, at 39 feet above high water, and is only visible 5 miles, from S. 7° E. to S. 71° E.

---

See charts, Nos. 1,382 and 1,158.

\* Lieut. S. Sladen, H.M.S. *Wild Swan*, 1896, says with regard to this pass, "Lloyd's agent informs me that at full and change in the summer a heavy swell sets in from the north-west without any apparent cause. Such a swell had set in two days before our arrival when the pass was a mass of breakers, and the velocity of the outgoing stream was estimated at 6 knots. There was no wind at the time." It further appeared that the *Wild Swan* was at this very time approaching from the north-westward and about 300 miles distant with uniformly fine weather and light airs; yet, on her arrival there were still light breakers across the pass, and the stream was running out and to the westward about 4 knots.

† Lieut. Stafford, U.S.S. *Abarenda*, reports (Aug. 5th, 1899) that this light cannot be seen more than 3 miles, and that it is difficult to distinguish the leading lights at all among the torches used by the natives fishing on or along the reefs.

A white truncated pyramid beacon stands on a mound in the ravine on the same bearing and  $5\frac{1}{2}$  cables from the upper light. See view on chart No. 1,382.

**Motu uta** is a little sandy island planted with cocoanut trees, and lying 3 cables S.W. by W. of Fareute point between the shore and the barrier reef. It stands on a coral reef awash, separated from the neighbouring reefs by deep channels. There is a battery on the north-western side of the island, and a gun is placed as a beacon on the eastern extreme of the reef, opposite Fareute point.

Three other reefs awash, separated by deep channels, lie south-westward of Motu uta, extending in a line in an E.S.E. direction from the pass. The western reef is marked by a gun on the western edge, and a black beacon on its South extreme. The other two reefs are each marked by a gun on their southern ends.

**Rock.**—Less than a cable south-westward of the black beacon just mentioned, and  $2\frac{1}{2}$  cables S.E. of the pass is a rock, formerly with a depth of  $4\frac{1}{2}$  fathoms over it and marked by a buoy; the depth over it has, however, been increased to 32 fect, and the buoy removed.

**Directions.**—Papieté harbour presents no difficulty of entry or exit for a steam-vessel, and may be used by large vessels, except in gales from the north-westward. For sailing vessels, great caution is necessary, as already remarked, especially in light winds, and a pilot should always be employed.

By night, sailing vessels should never attempt to enter, as they are almost sure to find the land breeze in the pass.

For entering, bring the two obelisks in line S. by E.  $\frac{1}{2}$  E., and steer in on that bearing with good way on until the two lighthouses and white beacon on the hill come in line; then haul up and run in on the latter line S.E.  $\frac{1}{2}$  S., and steer for anchorage, which, avoiding the various shoals described, may be found in all parts of the harbour in from 8 to 18 fathoms to within half a cable of the shore. If intending to remain some time, it is best to moor, as the constant shifts of wind are almost certain to cause a foul anchor.

**Weather.**—Rain squalls seen in the direction of Venus point and a little to the southward of it, usually reach the anchorage; but those collecting over Aorai peak and the other heights seldom descend to the harbour.

**Hospital.**—Seamen are admitted to the military hospital on payment of about 7 to 8 shillings per diem.

---

See charts, Nos. 1,382 and 1,158.

**Tug.**—There is a small steam-tug at Papieté which tows vessels for 3 miles from Motu uta, charging 25 francs per 100 tons or fraction of 100 tons. To obtain her services it is only necessary to ask by the International code of signals, and the request is passed on from the semaphore signal station. This tug is generally absent from Papieté from 3 p.m. on Saturday to 3 p.m. on Sunday.

**Repairs.**—The French Government has an arsenal and factory on Fareute point, where small repairs to machinery may be effected, and there is a quay adapted for heaving down vessels of all sizes. There is no dry dock nor any convenient place to lay a vessel aground, the bottom being coral, and the tidal range only one foot.

**The patent slip** will take a vessel of 300 tons, and has taken one of 600 tons; the cradle is 117 feet long, the slip 450 feet, and the width of cradle 20 feet with extension to 30 feet. Draught,  $6\frac{1}{2}$  feet forward and 13 feet aft.

Schooners of 65 tons have been built here by private firms, and sheers erected to lift 20 tons.

**Supplies.**—Beef of indifferent quality, brought from the Marquesas and Sandwich islands, may be obtained, also good native pork; poultry is dear, vegetables and fruit cheap and abundant.

**Water** may be procured from a tank or brought off from alongside the quay in bulk from the hydrants, either at the arsenal wharf or the government wharf opposite the French flagstaff.

**Coal.**—The Government has a coal dépôt of about 2,000 tons; and a supply can generally be obtained from the Société Commerciale, or from one of two other private firms, but the quantity in stock is irregular and uncertain; it is chiefly French and Australian coal, the price of the latter being about 44 shillings; Cardiff coal is about 66 shillings per ton. Vessels drawing 17 feet can coal alongside the wharves. There are three small lighters belonging to the Government.

**N.W. COAST.**—From Papieté pass, the barrier reef trends for about 3 miles W.S.W., at from 6 cables to one mile from the shore, then it turns sharply S.S.E. for 3 miles to Taapuna pass.

From Papieté to Taapuna valley, the foot of the mountains is close to the sea, with here and there a narrow wooded plain between it and the beach. This coast curves slightly as far as Faa village, opposite which is the large wooded islet, Motu Tehiri, and then trends at right angles S.  $\frac{1}{2}$  E.  $5\frac{1}{2}$  miles to Punaavia point.

**Faa channel.**—Between the barrier reef and the coast, there is a channel about 5 miles long and from half a cable to  $3\frac{1}{4}$  cables wide, with

depths of from  $6\frac{1}{2}$  to  $13\frac{1}{2}$  fathoms, connecting Papieté harbour with Taapuna pass. This channel is accessible to large vessels; it has, however, several mid-channel shoals, all of them plainly visible from the masthead.

The water thrown in by the surf breaking over the barrier reef collects in this channel, and escapes on the one side by Papieté pass and on the other by Taapuna pass.

**Taapuna pass** is dangerous and is not recommended. Its direction is about E. by N. and W. by S., and it is more than half a cable wide between the reefs awash, but is encumbered by shoals, of which one has only 7 feet water; between these shoals, there is only a narrow and winding channel of deep water.

The current always sets out strongly, especially when the sea is heavy upon the reef; at such times the surf breaks upon the shoals in the pass, which then becomes a mass of breakers.

Small vessels or boats when bound to any place between Papieté and Taapuna, if circumstances permit, should enter by the Papieté pass; and no sailing vessel should attempt to enter by the Taapuna pass, unless assured of a strong fair wind to enable her to stem the current. If compelled to enter, however, she should keep in mid-channel in the outer part of the entrance, steering E.N.E., then edge away to port and keep close to the reef on the northern side.

When going out, it is easiest and most direct to keep very close to the reef on the northern side, steering about West, but this leads over some patches of 13 feet, on which even a small vessel might touch with any swell on. To follow the winding passage where there is more water, it is necessary to steer from aloft.

**West Coast.**—From Taapuna valley, the narrow plain between the foot of the mountains and the coast becomes broader and is sometimes half a mile wide. At  $1\frac{1}{2}$  miles South of Taapuna pass is the Punaaru valley, an immense gorge cutting the mountains from top to bottom and penetrating to the middle of the island, where it opens out into a vast amphitheatre hemmed in by the peaks Orohena, Aorai and Diadème, which are visible to seaward when opposite the gorge.

The Punaaru river runs through this valley, and its deposits have formed Punaavia point and the bottom of the bay of that name.

On the lower slopes on the left bank of the Punaaru are several blockhouses, constructed when the French took possession of the island. Another blockhouse is on the shore at Punaavia point, and an iron bridge crosses the river about half a mile inland. From Taapuna pass the barrier reef approaches the coast and joins the beach 6 cables northward of

Punaavia point. Between Taapuna and this point, there is a passage for boats between the reef and the shore. A narrow gap named Taipari pass allows the escape of all water accumulated by the surf breaking over the reef.

**Punaavia bay**, about  $1\frac{1}{2}$  miles southward of Taapuna pass, where the barrier reef ceases and forms a small bight, is about 6 cables long. Here anchorage may be obtained in depths up to 27 or 33 fathoms, sand and mud; it is, however, perfectly open, and the heavy S.W. swell rolling in on the gravel and sandy beach at the head of the bay nearly always renders landing both difficult and dangerous. The best anchorage is half a mile from Punaavia point, in from 8 to 11 fathoms, sand and mud, with the blockhouse on the point bearing S. by E.

**Shoals.**—In the northern part of the bay, opposite the end of the barrier reef, there is a coral reef 5 cables off-shore and about 3 cables long North and South, on which are depths varying from  $6\frac{1}{2}$  to 13 fathoms. At  $2\frac{1}{2}$  cables N.W. by N. from Punaavia point is the Phaeton shoal of 16 feet.

The winds which blow along the land do not generally reach the anchorage, and those intending to leave under sail have usually to wait for the land breeze.

The current always sets from Punaavia point to the northward and north-westward, being caused by the flow of water accumulated inside the reef extending from that point to the southward. This reef extends about 5 cables from the land, and the channel lies close round Punaavia point, allowing boats to pass inside the reef as far as the village of Paea, 4 miles to the southward, where there is a break in the reef of about one cable.

**Paea.**—This part of the coast is easily recognised, and Orofere valley, behind the village, is the only one which appears to penetrate into the middle of the island after leaving Punaavia. Near the shore the chief house in Paea may be distinguished behind a row of fine iron-wood trees.

On both sides of the gap opposite Paea are boat passages through the reef; they are always dangerous and become impracticable when the sea is heavy. The northern pass is the best; the southern pass being a mere rapid where the current rushes out with great velocity.

Only very small vessels ought to anchor in the gap in the reef, and then only in case of absolute necessity, as it is a dangerous place.

**West Coast.**—From Paea, the reef trends without a break for  $3\frac{1}{2}$  miles to Maraa point, at about 5 cables from the land, and rounds the point at about 6 cables, where it is not so steep-to as usual, so that it would be prudent not to approach the breakers too closely.

Maraa point is low, wooded, and, projecting 200 or 300 yards from the foot of the mountains, may be easily recognised from seaward, by the sudden turn in the direction of the coast from S.S.E. to E.  $\frac{1}{2}$  S. From a distance, the mountains appear to form a gentle declivity, which falls suddenly towards the sea by a steep slope of from 300 to 600 feet in height.

**Maraa pass.**—In the middle of the rounded part of the reef, S.  $\frac{1}{2}$  W. from Maraa point, is a pass about one cable wide, open to S.S.W. At the entrance, the points of the reef on each side extend nearly one cable seaward of the breakers.

To enter the pass, approach the middle steering N. by E.  $\frac{1}{4}$  E., and when close up, keep close to the eastern reef so as to pass eastward of two coral patches, on the southernmost of which is only 13 feet water. A small vessel may pass westward of these patches which are separated from the western reef by a narrow but deep pass.

The current in the pass nearly always runs to the westward, but a series of westerly winds will turn it to the opposite direction; its strength depends on the state of the sea on the neighbouring reefs, and sometimes in the winter season, when heavy swells from the S.W. are common, it attains a rate of from 4 to 5 knots: on meeting the sea, it then breaks right across, and entering becomes impracticable. The tidal movement also influences the current, as it decreases in strength during the flood, *i.e.*, in the morning; and increases with the ebb.

Opposite and within the pass, near a little watercourse, anchorage may be obtained in 11 fathoms, sand, with Maraa point bearing W.  $\frac{1}{4}$  N. about 2  $\frac{1}{2}$  cables.

**The Barrier reef.**—From Maraa pass, the barrier reef extends eastward for 3  $\frac{1}{2}$  miles, about 8 cables from the shore, and inside it are a series of large basins strewn with coral patches, with deep water between, where anchorage may be obtained almost anywhere. The inner channel here is marked by beacons with colours and top-marks applicable for navigating from West to East, from Maraa as far as West Ava-iti. Besides Maraa pass there are two other channels through the reef; Topiro pass, 1  $\frac{1}{2}$  miles eastward of Maraa pass, and West Ava-iti pass, 2 miles farther East; they are small, deep, and only practicable for boats in calm weather; when the sea is heavy they are very dangerous.

At Terehe, about one mile eastward of West Ava-iti pass, there is a boat passage in the reef opposite the house of the Chief and of the church of Papara, both of which are visible from seaward; the current runs out strongly and the passage is only practicable when the swell is not very heavy.

**South coast.**—From Maraa point, the coast trends E. by S.  $5\frac{1}{2}$  miles to Popote bay; the appearance of the country changes, the climate becomes moister than the part between Venus point and Maraa point, the trees descend to the foot of the mountains, and in the plain the orange and citron flourish abundantly.

From Papara, the foot of the mountains recedes from the coast, leaving a plain about half a mile broad and 5 miles long.

**Popote bay.**—This bay is formed by a break in the reef about half a mile wide, and by some banks extending  $2\frac{1}{2}$  cables seaward from the eastern reef, enclosing a harbour in which the depth does not exceed 11 fathoms, sand and gravel: it is too much exposed to the south-westerly swell to be a safe anchorage, but is convenient with easterly winds.

Taharuu river, one of the largest in Tahiti, flows into this bay from a deep gorge penetrating to the middle of the island.

**The Barrier reef.**—The barrier reef recommences at Malaiatea point, which point forms the eastern side of Popote bay, and is one of the highest of the generally low points on the southern side of the island. The reef, extending about one mile from the land, forms a curve for more than 3 miles eastward to Aifa pass and encloses the large basin of Altimaono, with depths of from 8 to 16 fathoms, which, although strewn with coral patches offers numerous anchorages which, during the prosperous times of cotton cultivation in this neighbourhood, were much frequented. These inner channels and passages are beacons according to the French system, see page 19, and for entering from seaward by the Aifa pass.

**Teavaraa pass,** is at the western end of the Atimaono basin, about one mile south-eastward of Popote bay; it is wide but has only 13 feet water in it. Directly exposed to the swell from South-west, it is more of a bar than a pass and the sea almost always breaks across it. Small vessels may possibly use it when easterly winds prevent their getting out of Aifa pass, as they can make sure that the bar is practicable before getting under way, but they should never attempt to enter by it under any circumstances.

**Aifa pass.**—This pass is formed by a break 2 cables wide in the barrier reef, obstructed on the western side by a bar extending about 2 cables seaward, leaving an oblique channel about 100 yards wide between it and the point of the eastern reef, which latter point is steep-to and clean. This pass is often dangerous, and with the heavy swell from the southward, so commonly experienced, the current running out against the sea, causes tremendously heavy breakers right across the entrance, when it would be the height of rashness to attempt entering.



To enter Aifa pass in a sailing vessel, make sure that the sea is not in the dangerous state just described, and that there is a fresh breeze inside the reefs. Steer N.W.  $\frac{1}{2}$  N., passing close to the point of the reef on the eastern side, and then haul up to N.N.W.  $\frac{1}{2}$  W. Four coral patches will then be left on the port hand, with a small sandy islet on the most northern. Then pass between two small patches, awash, each marked by a red buoy,  $1\frac{1}{2}$  cables apart, lying just westward of the South point of Mapeti island, which is near the N.W. end of the eastern reef. Then, keeping a little to port, leave a coral patch, whose northern point is marked by a black beacon, on the port hand. Another coral patch lies  $1\frac{1}{2}$  cables S.W. of the above patch and is also marked by a black beacon.

Anchorage may be obtained between the two black beacons and the land in from 11 to 16 fathoms, sand, close to the house of the Chief of Mataiea, situated on the banks of a river.

When going to sea, pass close to the point of the eastern reef and then steer S.E.

**Rautirare pass**, about  $1\frac{1}{4}$  miles East of Aifa pass, is the best pass in Tahiti; it is 2 cables wide, open to the southward, perfectly clear, very deep, and practicable at all times. On the eastern side of the channel near the north-western corner of the reef is Pururu islet, about 5 cables inside the outer line of breakers.

The pass opens into Papeuriri bay, which extends about  $4\frac{1}{4}$  cables each way. It is perfectly clear and the depth varies from 8 to 13 fathoms, black sand; lesser depths of 5 fathoms extend at most to 150 yards from the shore. The coast is lined with sandy beach, and the river Vairaharaha discharges into the bay opposite the pass.

Anchorage, generally safe, may be obtained anywhere in the bay, and especially near Pururu islet. The pass is, however, so wide that a vessel would not be sheltered from strong winds and a heavy sea from the southward, but would have to enter one of the channels communicating either with Aifa pass on the West, or with Temarauri pass on the East.

**Otutara channel**, which connects the anchorage opposite Aifa pass with Papeuriri bay, is a narrow inner beacons channel about  $8\frac{1}{4}$  cables long and 50 yards wide in the narrowest part, having a depth of from 8 to 11 fathoms, with the exception of two shoal patches on which there are only  $3\frac{3}{4}$  and  $3\frac{1}{4}$  fathoms.

**South coast.**—From Otiaroa point, opposite Pururu islet, the coast bends to the northward for about half a mile, and then trends irregularly E. by N.  $\frac{1}{2}$  N. 3 miles to Oneroa point, which point faces Hotumatuu pass. The mountains, wooded to the base, are cut into a series of gorges, parallel with one another, from which several rivers flow.

**Temauri pass**, also called Papeari pass, is about 5 cables westward of Hotumatuu pass, and gives access to a series of basins extending westward for about  $1\frac{1}{2}$  miles, and communicating by a narrow channel with Papeuriri bay. It is one cable wide and 3 cables long in a N.W. by W. direction; but the eastern reef extends S.S.W. right in front of the pass, and forms a bar which it is generally unwise to cross. The pass thus forms an elbow at its mouth in a North and South direction.

A small reef, awash, marked by a red spindle beacon, lies about  $2\frac{3}{4}$  cables inside the entrance, and about 100 yards from the eastern reef, leaving a passage about 150 yards wide between it and the western reef.

On entering this pass, steer N. by W.  $\frac{1}{2}$  W., leaving the point of the western reef about half a cable on the port hand; after rounding this point, alter course to N.W. by W., looking out for the isolated reef on the starboard hand.

**Papeari harbour.**—Temauri pass opens out into Papeari harbour, an anchorage about 5 cables long and 4 cables wide, separated by a point projecting from the barrier reef to within 2 cables of the shore from a second basin, named port Ataiti. This point and bank projecting from the barrier reef leave a passage into port Ataiti only 100 yards wide between them and the land, with nothing less than 5 fathoms. The north-eastern point of the bank and many of the shoals within are marked by beacons.

The depths in Papeari harbour vary between 13 and 19 fathoms, sand or mud; the usual anchorage is in the direction of the pass at from 2 to  $2\frac{3}{4}$  cables from the land, opposite the mouth of a small rivulet.

Ataiti harbour, or basin, is  $1\frac{1}{2}$  miles long and from  $2\frac{1}{2}$  to 6 cables wide, and is an open space between the shore and barrier reef, with depths varying between 5 and 8 fathoms, muddy bottom.

**Hotumatuu pass** is a break in the barrier reef  $1\frac{1}{2}$  cables wide. It is more of a cul-de-sac than a pass, as it does not lead into any important basin. Small vessels may, however, find shelter from westerly winds at the head of the pass, in the port of Paui, where the depth is from 9 to 12 feet only.

**South coast.**—From Oneroa point, the coast takes a sharp turn, and trends N.N.E. about 2 miles to Taravao isthmus; two deep bays blocked with coral breaking its general direction. The mountains, wooded from top to bottom, approach the sea, and fall abruptly to the isthmus, which is only about 100 feet high.

From the isthmus, the coast returns parallel to itself for about one mile to Teaua point, forming port P'haeton, about  $3\frac{1}{4}$  cables wide. From Teaua point, the coast trends S.E. one mile to Tohautu point, which direction it preserves to the south-eastward.

From the isthmus to Tohautu, the coast is low, wooded, and broken by deep bays blocked with coral. At the entrance to one of these, Mitirapa bay, is a bridge, about midway between Teaua and Tohautu. The land rises in gentle and uniform slopes to the high and rugged mountains in the centre and southern part of the Taiarapu peninsula.

From Tohautu point, the hills approach and almost overlook the sea. The first of these, Farei hill, has a bare rounded summit overlooking Tohautu, and forming a good mark from seaward by which to make the two white pyramids placed at Tohautu as a leading mark into Teputo pass.

From Hotumatuu pass, the barrier reef trends eastward for one mile to Teputo pass, and then turns suddenly S.E. by S. and in that direction along the coast.

**PORT PHAETON.—Teputo and Matu passes.**—Teputo pass is the most direct entrance to Port Phaeton, but though the outer opening through the reefs is nearly 2 cables in width, for a distance of about one cable it is only 130 yards wide, though deep and clear of dangers. This break in the barrier reef is at the angle where it commences to trend away to the south-eastward. At 2 cables within the entrance, the western reef curves away to the North-west, and the eastern reef turns sharply eastward. Inside, and in front of the gap, is the Matuhu bank, a large coral reef of irregular form about 5 cables long from South to North, and marked at its northern extreme by a tripod beacon. This bank divides the opening into two distinct passes, that of Teputo on the eastern, and of Matu on the western side. The latter is about 2 cables wide, but has a small bank in the middle, leaving a deep channel about 150 yards wide between it and Matuhu bank; it forms a sharp elbow, however, and not being marked by beacons should not be attempted except in case of necessity.

**Beacons.**—Two white pyramids in line N. 59° E. form the leading mark for Teputo pass; the front beacon is placed at the extreme end of Tohautu point, the rear beacon near the foot of the northern slope of Farei hill, which hill, as before stated, forms a good guide to their locality when approaching from seaward.

Directly a vessel is fairly through the pass in entering, the line of the beacons has to be quitted and a North course steered through the Tohautu basin, along the eastern side of the Matuhu bank, at the northern end of which, where stands the tripod beacon before mentioned, the Matu and Teputo channels reunite.

From the northern end of Matuhu bank, the channel up to port Phaeton is 2 cables wide between the reefs, and from 8 to 16 fathoms deep. Half

way between Matulu bank and Teaua point, a reef on the western side is marked by a black beacon on its eastern extreme. There is also a small patch near Teaua, at which point the channel opens into port Phaeton.

Port Phaeton is more than one mile long from Teaua point to Taravao isthmus. Near the head of the port is a stone jetty built out to the edge of the reef to facilitate landing; it is connected by a carriage road with Fort Tarivao and with the main road of the island. The sides of the harbour are indented by deep bays blocked with coral, but in the middle there is a channel 2 cables wide and quite clear, affording anchorage anywhere in from 5 to 11 fathoms, with excellent holding-ground of mud. Where the coral reefs project into the harbour they are marked by beacons.

**Anchorage.**—Toahutu basin, just inside the pass, affords safe anchorage in the western part, and the reefs on the eastern side are marked by beacons; the anchorage is about 5 cables long North and South, by  $2\frac{1}{2}$  cables wide, in from 16 to 22 fathoms, sand and mud. With Toahutu point bearing E. by N.  $\frac{3}{4}$  N. and Mitirapa bridge N. by E.  $\frac{1}{4}$  E., there is  $1\frac{1}{2}$  cables swinging room in all directions.

**CAUTION.**—The Teputo pass is only recommended in fine weather. With a heavy south-westerly swell in the narrow part of the pass, there is great risk of a sea striking a ship on the port quarter and forcing her bow round to port and the vessel on to the rocks on the weather side before she can be kept away again. In such weather it is best to enter by the Tapueraha pass, and then to proceed by the inner channel to port Phaeton.

**South coast.**—From Teputo pass, the barrier reef trends in a straight line S.E. by S. about 5 miles to East Ava-iti pass. At  $2\frac{1}{2}$  miles from Teputo pass is Tapueraha pass, and the barrier reef between the two, which is about 5 cables wide, is named Temaino reef.

**TAPUERAHA PASS** is about 3 cables wide, but the navigable channel is narrowed by a shoal extending southward about  $1\frac{1}{2}$  cables from Temaino reef, over which there are only from 9 to 12 feet water, and by a shoal from the southern reef, over which there are about 3 fathoms, leaving a deep channel about one cable wide between them. When within these shoals the pass rapidly opens out.

As before remarked, with a westerly swell this pass is much to be preferred to Teputo pass when bound for port Phaeton.

**Directions.**—To enter by Tapueraha pass, bring the pyramid on the beach in line with a hummock on the hills behind, bearing N.E. by E.  $\frac{1}{4}$  E.,

which leads in. Off Riri point the passage is very narrow, a reef lying in mid-channel; the western passage is the straighter and better.

Inside the pass is a safe harbour about 8 cables wide, with anchorage in from 10 to 22 fathoms. The swell enters by the pass and breaks upon the beach. At  $2\frac{3}{4}$  cables inside the entrance is the Roue reef, a small patch with  $3\frac{3}{4}$  fathoms; another patch, the Tahire reef, of only 5 feet lies about  $2\frac{3}{4}$  cables south-eastward of the entrance.

Between Temaino reef and the shore is a narrow channel, marked with beacons, connecting Tohautu basin with this harbour; and another channel,  $2\frac{1}{2}$  cables wide, leads into port Vairao, the large basin to the southward, in which there is generally muddy bottom with from 8 to 16 fathoms water; there are several reefs marked by beacons, and anchorage may be obtained almost anywhere amongst them.

**South coast.**—Southward of port Vairao is a rounded point where the coast turns to the eastward for about 3 cables and then trends S.E. for about  $1\frac{1}{2}$  miles to the low point Arahuku, close to which is the village Teahupu, it then continues in the same direction for  $1\frac{1}{4}$  miles to the low point Fare Mahora, after which it trends E.  $\frac{1}{2}$  S. for 5 miles to Fareara point, the south-eastern extreme of the Taiarapu peninsula.

The whole of this coast is dominated by high mountains, between which are deep gorges and valleys trending towards the centre of the peninsula.

**East Ava-iti pass.**—This is a small pass about 80 yards wide and 2 cables long, with from 13 to 16 feet water at the entrance; it is only practicable in very fine weather and for vessels of small tonnage.

**The Barrier reef.**—From East Ava-iti pass, the reef curves eastward for  $2\frac{1}{2}$  miles, past Ava-ino pass, to Havae pass, on the eastern side of which it rejoins the shore at Fare Mahora point, leaving only a boat channel along the shore into port Beaumanoir. It then trends E. by S. for about 4 miles, at about 5 cables from the shore, past Puuotohe pass as far as Vaiau pass, situated opposite a valley of the same name.

Beyond Vaiau pass, it trends E.S.E. for one mile and then turns sharply to the northward to within one cable of the shore, from which it is separated by Tutataroa pass. It thus forms a point beyond which the line of reef continues in a series of coral banks along the coast at about one mile from the shore.

Inside this line of reefs are some basins of deep water, which are, however, much encumbered by coral patches, and the passes through the reefs are narrow and often shallow, so that they can only be made use of in fine weather.

**Ava-ino pass** is about 3 cables wide, but is only a bar, which ought never to be used by vessels. Boats can only enter when the sea is calm, and have always to be careful of the blind rollers.

**Havae pass** is at the south-eastern end of the basin of Teahupu, near Fare Mahora point and opposite a ridge which separates the valleys Mahire and Vaiaia.

This pass is straight, deep and clear, one cable wide and 2 cables long, opening out into a small circular basin, where anchorage may be obtained in 13 fathoms, sand, with swinging room of one cable. This basin being open to the pass is not sheltered from the swell from south-westward, and can only be considered a temporary anchorage.

On its north-western side is the channel, 60 yards wide and  $1\frac{1}{2}$  cables long, leading into the narrow but well-sheltered basin of Teahupu, where the holding-ground is good; but, when anchored in the middle, there is only about 130 yards swinging room.

**Port Beaumanoir or Toanoano.**—The basin, 3 miles long and about 4 cables wide, between the barrier reef and the shore, commences at Fare Mahora point and extends eastward as far as the valley of Vaiarava, where its waters joins those of port Vaiau by the Puforatiai channel. It has general depths of from 13 to 22 fathoms, sand and mud, and good holding-ground.

The port is clear of dangers except that from a low point about at its centre, a reef extends  $1\frac{1}{2}$  cables from the shore. The port is closed at its western end, except for the small boat channel already mentioned.

A pathway leads up the Vaiarava valley and through a gorge to the northern side of the peninsula, and it is the only practicable pathway across the peninsula.

**Puutohe pass**, about  $1\frac{1}{2}$  miles eastward of Havae pass, is nearly 2 cables wide, but the eastern side is occupied by a shoal, which leaves a channel from 40 to 50 yards wide, and  $3\frac{3}{4}$  fathoms deep, practicable only in fine weather. The pass is only half a cable long and opens out quickly after the breakers are passed into port Beaumanoir.

**Vaiau pass and Port.**—Vaiau pass, near the southern end of the peninsula, lies opposite mount Faretua, a large mountain whose summit, 3,189 feet high, is well marked. The break in the reef is one cable wide, but a reef awash divides it into two channels. The eastern channel is narrow and winding, and, although  $4\frac{1}{4}$  fathoms deep, is only practicable for boats in fine weather. The western channel is half a cable wide, but has a small coral head, on which are  $2\frac{3}{4}$  fathoms, projecting a short distance

---

See chart, No. 1,382.

N.W. of the middle reef. The outer point of the western reef extends 2 cables seaward, but is steep-to inside the pass.

Inside the barrier reef is the open space called port Vaiau, about one mile long and 3 cables wide, with depths of from 10 to 22 fathoms, mud. its western end opening into port Beaumanoir. Although containing a great number of isolated shoals, it affords fair anchorage in 16 fathoms, with  $1\frac{1}{2}$  cables swinging room, S.W. of Marnetiria point, the low projection formed by the deposits of Vaiau river.

There are two openings into port Vaiau, viz.; that just described, and the Tutataroa pass.

**Tutataroa pass** is situated between the shore and the barrier reef, which turns to the northward towards the coast at about one mile eastward of Vaiau pass. It is one cable wide and 4 cables long in a W. by N. direction; the fringing reef does not extend more than half a cable from the beach, but is prolonged at the entrance by a small patch of 6 feet, which leaves the deep channel only 130 yards wide; another patch projects from the fringing reef where the pass opens into port Vaiau. The barrier reef is steep-to on the southern side of the pass.

**East coast.**—From Tutataroa pass, the south-eastern coast of Taiaapu peninsula, trends E.N.E. 2 miles to Rapae point, and then N.N.E. 2 miles to Vaiote valley, opposite which the barrier reef, awash, recommences.

The part of the coast, not defended by barrier reef, awash, presents a very different appearance to that part which is so defended; the mountains fall precipitately to the sea, forming a line of steep cliffs, against which the sea breaks furiously with fresh breezes from the eastward; whilst the barrier reef as a series of submerged reefs, named Faratara reefs, lies from one to  $1\frac{1}{2}$  miles to seaward. These reefs and banks have from  $2\frac{1}{2}$  to 11 fathoms over them, and the heavy swell from the south-westward which strikes upon them, together with the sea raised by easterly winds, cause tremendous breakers. Between the Faratara reefs and the shore there is deep water interspersed with banks; the whole vicinity should be carefully avoided.

From Vaiote valley, the coast trends northward for about 3 miles to the fine valley of Vaitoto; very little is known about this part.

The reef awash, which commences off Vaiote, extends along the coast to the northward about one mile from the shore; two wooded islets, named Fenuaino and Tiere, are situated near the southern end of this reef, opposite Tomotai valley. A pass lying between these islets and the reef of the islet Tehuaroto, near the shore, leads to an anchorage opposite this valley.

**Tomotai pass.**—This is a dangerous pass which has a W. by N. direction, and, when entering or leaving, it is necessary to keep near the northern reef to avoid some sunken rocks. When Fenuaino islets are on

the starboard beam on entering, alter course to the northward to gain the anchorage.

**Aiurua pass** is about one mile North of Tomotai pass; the sharp peak of mount Teiche in line with the pyramid at the foot of mount Aiurua bearing W.  $\frac{1}{4}$  S., leads in, avoiding the spit of 13 feet which extends one cable from the barrier reef on the northern side of the pass, and reduces the deep water width of the pass to about 110 yards. Inside to the southward is the anchorage already mentioned as also reached by the Tomotai pass; and to the northward is a good harbour which communicates with Vaionifa pass about 3 miles farther North, by a deep channel, but in which are many scattered coral patches requiring great care in its navigation.

**East coast.**—From Aiurua pass, the coast trends northward  $2\frac{1}{2}$  miles to Vaitoto point, where a river of the same name flows into the sea through four mouths in expanding from a single stream through a deep and cliffy gorge which penetrates far into the interior. The point is the eastern extreme of low land projecting about 3 cables from the foot of the mountains, and is formed by the debris brought down by the river.

From Vaitoto, the coast is bordered by low ground from one to 2 cables wide, trending N.W. 3 miles to Tautira point, from whence it turns W. by N. towards the isthmus of Taravao.

**Tautira point**, on which is an important village, is a tongue of low wooded land about 3 cables wide, extending northward three quarters of a mile from the general line of the coast, and from the foot of the mountains, and is formed by the deposits from the Vaitepiha river, one of the largest streams in Tahiti.

**The Barrier reef** fronts the coast from Aiurua pass to Tautira point at 5 cables and less from the shore, enclosing channels and basins of deep water inside. From Vaionifa pass, it trends N.W. in a straight line, rounding Tautira point at only 2 cables and breaking off abruptly just westward of the point where there is a gap with very deep water 4 cables wide before the reef again commences.

Between Vaionifa and Tautira there is a smaller gap about 2 cables wide, in which there are only 9 feet water.

**Vaionifa pass** is about one cable wide,  $1\frac{1}{2}$  cables long, and open to the north-east. The point of the reef on the northern side extends eastward about half a cable, but the remainder of the pass is safe. Inside, and just opposite the pass, at one cable from the shore, is a small patch with only 3 feet water, marked by a beacon.



To enter the pass, steer S.W. in mid-channel with the highest peak of mount Roniu showing over the foot of mount Vaionifa.

Between this pass and Tautira, there is a channel from 2 to 3 cables wide and  $2\frac{1}{2}$  miles long, which ends in a cul-de-sac at the northern end, with the exception of a small boat passage to the village. There are from 19 to 37 fathoms, mud, almost everywhere, but at the northern end the soundings decrease gradually to 16 and 8 fathoms.

Crab rock, marked by a beacon, lies in the fairway of this channel, about one mile N.W. from Vaionifa pass.

**N.E. coast.**—From Tautira point, the coast trends W. by N. 5 miles to a short distance beyond Pueu village. The general direction is straight, but two low and wooded points, Pihaa and Faraari, project about  $2\frac{1}{2}$  cables to seaward; the first at  $2\frac{1}{2}$  miles from Tautira, the second about one mile farther on. The mountains behind, from which numerous cascades descend, are steep and cliffy.

The only large break in the mountains is Haavini valley, which opens between Pihaa and Faraari points. The low land between the foot of the mountains and the sea is very narrow, except at the two points and in the entrance of the valley.

**The Barrier reef**, which, as before described, ends so abruptly westward of Tautira point, recommences half a mile farther westward, forming, with the point, Tautira bay or Cook's anchorage. It then trends parallel with the coast at 5 cables from the shore to a short distance beyond Pihaa point, where it is interrupted by the broad Taharoa pass, westward of which it curves round Faraari point at a distance of 3 cables for one mile beyond that point.

These reefs are separated from the shore by passes, and basins of deep water named ports Pihaa and Pueu.

**Tautira Bay**, or Cook's anchorage, is formed by Tautira point and reef on the eastern side, and by the barrier reef on the western side.

It is half a mile wide, about the same depth, and open to N.W., affording protection with winds from N.E. through East and South to W.N.W., but dangerous with those between North and W.N.W. Cook anchored several times in this bay, from which circumstance the name is derived.

The depth in the middle of the entrance is from 35 to over 60 fathoms, diminishing gradually to the shore. The bay is clear, except a small patch of 2 fathoms, one cable southward of the point of reef on the western side. The eastern and south-eastern shore is lined with a sandy beach.

The best anchorage is at about 2 cables from the shore in  $8\frac{1}{2}$  fathoms, sand, with the extreme of Tautira point bearing N.E.  $\frac{1}{4}$  N.

**PORT PIHAA** is the deep basin, from 3 to 4 cables wide and  $1\frac{1}{2}$  miles long, between the barrier reef and the shore, extending from Tautira bay to Pihaa point, with depths nearly everywhere of from 16 to 19 fathoms, sand and mud.

There are two openings into this port, that from the eastward from Tautira bay being one cable wide, but divided by the small 2-fathoms patch above mentioned; the other from the westward, from Taharoa pass, is only about 60 yards wide. There are several small patches and reefs, especially near the eastern end, and anchorage is good in all parts where not encumbered by shoals.

**Taharoa pass and Bay.**—Taharoa pass is a break in the reef about 4 cables wide opposite Haavini valley. Just within the entrance is Toataa shoal about one cable wide, with only from 3 to 6 feet water over it; the channel on the eastern side is about one cable wide, that on the western side 2 cables. There are also three other small patches in the bay from 1 to  $1\frac{1}{2}$  cables from the shore and almost on the line of points Pihaa and Tautira in one.

The best mark for entering is to steer S.S.E.  $\frac{1}{4}$  E. for the cascade at Pihaa; this leads through the middle of the eastern channel. The barrier reef on the eastern side is steep-to.

**Port Pueu** is situated between the barrier reef and the shore near a village of the same name, just westward of Faraari point; from which point the coast trends westward for  $1\frac{1}{2}$  miles to the low point Tiitau, the barrier reef lying parallel with the shore about 3 cables distant for  $1\frac{1}{2}$  miles from Taharoa pass, and ending abruptly 5 cables N.E. of Tiitau point. At 2 cables westward of this reef, and North from Tiitau point, is an isolated patch about 2 cables in diameter, of which the central part is awash. The channel between the western end of this reef and the isolated patch awash is called the Tiitau pass. The deep part is about  $1\frac{1}{2}$  cables wide.

Between the barrier reef and the shore is a deep channel, which opens out a little westward of Faraari point and forms the basin  $2\frac{1}{2}$  cables wide known as port Pueu, in which the depth varies from 13 to 25 fathoms, sand and mud. Entrance to port Pueu can be effected either from the eastward by Taharoa pass or from the westward.

**Caution.**—About  $7\frac{1}{2}$  cables westward of Faraari point, the barrier reef becomes submerged for about 2 cables; on this part there are only about 6 feet water, but in fine calm weather it might easily be mistaken for a pass.

**N.E. coast.**—From Tiitau point the coast trends W.S.W. and then W. by N.  $3\frac{1}{2}$  miles to Taravao isthmus, from thence it turns and trends N.  $\frac{1}{2}$  W.  $6\frac{1}{2}$  miles to Boudeuse pass.

The mountains, which are high and steep behind Pueu, descend in a gentle slope towards the isthmus; they are generally bounded towards the sea by perpendicular cliffs which overlook a strip of low land about one cable wide.

On the highest part of the isthmus, and visible from the sea to the eastward, stands Fort Taravao.

Northward of the isthmus, the mountains, densely wooded, form the coast-line, broken only by numerous ravines, of which the most important are those of Papeivi, Vaitoare, and Faone; the first at one mile, the second at  $1\frac{1}{2}$  miles, and the third at 3 miles from Taravao.

**The Barrier reef.**—From the isolated patch off Tiitau, the greater part of the Barrier reef is submerged, but forms a long chain of shoals trending W. by N. for 3 miles to Papeivi pass, the deep passage which separates it from the reef off Vaitoare. The width of the reef is not more than one cable, and the depth varies generally from 9 to 20 feet, though at some places the coral is awash, and at others there are 5 or 6 fathoms, forming passes into the basin inside.

**TARAVAO BAY** is the large expanse of water between the barrier reef and the shore, nearly one mile wide and more than 3 miles long. It is open to the N.E. and exposed to winds from between North and East, as the banks of the barrier reef afford insufficient shelter from the sea which breaks on the beach. The bay is entered by the Tiitau pass, already described, at the eastern end; by the Motu Nono pass in the middle; and by the Papeivi pass at the northern end. The general depth is from 21 to 27 fathoms, shoaling near the shore, and the mud bottom affords good holding-ground.

**Motu Nono** is a wooded islet in the bay inside the line of shoals 5 cables from the shore and  $1\frac{3}{4}$  miles E.  $\frac{3}{4}$  N. from Fort Taravao. It is surrounded by a shoal extending nearly one cable from its beach.

Two isolated patches lie W. by N.  $\frac{1}{2}$  N. from Motu Nono, one at 3 cables, with 2 fathoms; the other, at one mile, with  $2\frac{1}{2}$  fathoms. Another patch, with 6 feet, lies 4 cables East from the islet. A vessel is clear of all danger within the bay, with the South extreme of Motu Nono bearing between E. by S. and E.N.E.

**Motu Nono pass** is a depression in the line of reefs opposite the islet where there are from 4 to 5 fathoms. To enter by this pass, steer S. by W.  $\frac{1}{4}$  W. for the middle of the islet, and, after passing the

line of breakers, alter course so as to pass at more than one cable on either side of the islet.

**Taravao pass.**—By steering S.W. by W. for Fort Taravao, the line of submerged reefs will be crossed at a place where the depth is about 5 fathoms. This line passes within one cable of the  $2\frac{1}{2}$ -fathoms patch one mile W. by N.  $\frac{1}{2}$  N. from Motu Nono. In order to give this patch a wider berth, alter course to port after crossing the line of breakers, or when the islet bears S.E.  $\frac{1}{2}$  E.

**Papeivi pass,** between the extreme end of the submerged reefs and the southern point of the reef off Vaitoare, is about  $1\frac{1}{2}$  cables wide, with a least depth of 6 fathoms.

To enter the pass, steer S.W. by S. for Fort Taravao, which course will lead half a cable clear of the reef off Vaitoare.

**Port Vaitoare.**—From Papeivi pass, the barrier reef, awash, trends northward parallel with the coast at 4 cables from the shore, for  $1\frac{1}{3}$  miles, where it is separated by the Vaihi pass, a narrow and deep channel, half a cable wide, from the Paratahi bank, which again extends 3 cables to the northward to the Faone pass, 2 cables wide, opposite the Faone valley.

Port Vaitoare is the basin enclosed between the barrier reefs and the shore, where the depth varies from 19 to 27 fathoms, sand and mud. It is clear of danger with the exception of two small patches near the southern end, and the fringing reef does not extend more than 100 yards from the beach. It is entered either by the Papeivi, the Vaihi, or the Faone pass; the Vaihi being, however, very narrow. Anchorage may be obtained anywhere.

**N.E. coast.**—Between Faone valley and Hitiaa,  $4\frac{1}{2}$  miles to the northward, the mountains are very steep, broken by numerous valleys, and in some places towering over the sea. A short distance northward of Faone valley is a church with a spire, plainly visible from seaward.

**The Barrier reef.**—From Faone pass, the barrier reef trends northward at 5 cables from the shore for about three quarters of a mile until opposite the village of Utuofai; here, a break in the reef leaves a gap  $1\frac{1}{4}$  miles wide, opposite the Popeiha valley; the reef recommences opposite Faatautia and extends to the northward in a slight curve, at about 4 cables from the shore, for 2 miles to the Boudeuse pass, opposite Hitiaa.

**Faone anchorage.**—Between the reef and the shore, northward of the Faone pass, is an anchorage where protection may be obtained from the eastward, but the swell rolls in heavily from N.N.E. or S.E. The depth is generally from 10 to 16 fathoms, sand and mud, gradually decreasing towards the sandy beach which lines the shore. There are,

however, several patches, some nearly awash, so that caution is needed when using this anchorage. The best berth is in 14 fathoms, with the church bearing S.S.W.  $\frac{1}{4}$  W., and Tenuafarua point S. by E.  $\frac{1}{4}$  E.

**Port Tematooe.**—Inside the reef to the southward of Hitiaa is a deep water channel about 2 miles in length and 2 cables wide, gradually narrowing near the northern end, with depths varying from 13 to 22 fathoms, mud; it is known as port Tematooe. The entrance from the southward is  $1\frac{1}{2}$  cables wide, and anchorage may be obtained in the middle of the channel in about 22 fathoms. At the northern end, there is only a boat passage, and the reefs, extending much farther from the shore than in the middle and southern part, are marked at their eastern extremes by three beacons and by a small tower.

**N.E. coast.**—From Hitiaa, the coast trends N.W. by N. rather more than one mile to the low woody point, Mata-orio, northward of which is the small bay, Taipahia; from thence, it curves north-westward for about one mile to Putaiano point.

The plain near the coast is from one to 3 cables wide as far as Mata-orio point, beyond which the mountains come close down to the shore. At half a mile N.W. of Putaiano point is Mahaena village and church, where two rivers discharge into the sea near a sandy beach.

**The Barrier reef.**—Northward of Hitiaa point, the barrier reef is broken by Boudeuse pass, beyond which it trends northward for about half a mile, with a low wooded islet at each end, viz., Oputotara at the southern, and Variararu at the northern end.

Northward of Variararu, the reef is submerged for about 5 cables, forming a shallow pass, in the deepest part of which is a  $3\frac{1}{4}$ -fathoms channel, practicable only in fine weather. The reef then comes to the surface and trends N.W. by N. about one mile to abreast of Putaiano point, after which it extends for 5 cables with depths of from 2 to 3 fathoms over it to Mahaena pass. There are two low wooded islets on this reef, one named Motu Puuru, 5 cables N.E.  $\frac{3}{4}$  N. of Mata-orio point; the other, Nansouty islet, 5 cables farther North, and 7 cables eastward from Putaiano point.

From hence to Venus point, the barrier reef does not again come to the surface, but continues parallel with the coast as a chain of shoals, the first of which is the Fana or Artémise shoal.

**Boudeuse pass** is opposite Hitiaa, between the reef off that point and Oputotara islet. It is about 4 cables wide, but narrowed on the northern side by a shoal extending about 2 cables from the islet; in the middle of the pass is a  $4\frac{3}{4}$ -fathoms patch.

Inside the pass, and between the islets and the shore, is Bougainville harbour, an anchorage named after the celebrated navigator who anchored here in the *Boudeuse* frigate in 1776. It is fairly sheltered, but the bottom is strewn with coral heads, amongst which Bougainville lost several anchors. Caution is very necessary as there are several patches and reefs scattered about.

The Boudeuse pass communicates southward by a boat channel with port Tematoe, and to the northward with the channels inside the reefs and Nansouty islet as far northward as Mahaena pass.

**Mahaena pass** is an opening about half a mile wide between the submerged reef which extends 6 cables N.N.W. of Nansouty islet, and the southern end of the Artémise bank. A valley, through which the river Faa-iti runs and discharges into the sea, faces the pass. A vessel will enter through the middle of the pass by bringing the foot of the hills which border the southern side of this valley to bear S W.  $\frac{1}{4}$  W. and running in on that line.

The Mahaena pass leads by the Anapu channel, presently described, to some exposed anchorages to the northward, but the best anchorage may be obtained in from 19 to 25 fathoms, sand and mud, between the Nansouty and Motu Puuru islets and the shore, sheltered from seaward by the reef which joins the islets; it is, however, open to the N.W. and insufficiently sheltered in that direction by the submerged reefs extending to the northward. There is also anchorage a little farther southward in the little bay of Taipahia, sheltered by Motu Puuru islet. The swinging room at these anchorages is very limited considering the great depth of water, and the swell sets in with winds from seaward.

There are several 2-fathoms patches and reefs which must be avoided when picking up an anchorage here.

**N.E. coast.**—From Mahaena, the coast trends N.W. by N. one mile to the low point Faaru, then it curves W. by N. for  $2\frac{1}{2}$  miles to Onoheha, beyond which it trends N.W.  $1\frac{1}{2}$  miles to Faarumai valley. The mountains are close to the coast, and the only important valley is that of Onoheha, which penetrates far into the island, and has at its head the remarkable mountain Matotea; and, on its eastern side at the entrance, point Rauraia terminating in a precipitous cliff.

**The Barrier reef.**—From Mahaena round to Venus point, a distance of 12 miles following the line of the shoals, the barrier reef is altogether submerged, and forms a series of dangerous shoals, with general depths of about 3 fathoms, but often less, and extending from one mile to  $1\frac{1}{2}$  miles from the shore.

Between the shoals and the shore are large open basins or roadsteads, in which the depth does not usually exceed 27 fathoms, sand, and averages from 20 to 23 fathoms in the eastern part, and from 10 to 12 fathoms in the western part. Anchorage may be obtained in these basins, but the banks are too much submerged to afford shelter from the sea, and they are off that coast of the island which is the most fully exposed to the prevailing wind.

Several wide passes give access to these basins, and in fine weather small vessels can pass over the shoals when sure of the marks; but during the bad season, when the winds blow from seaward, the sea is very heavy upon all the shoals, especially Fana.

**Fana or Artémise shoals**, so named from the French frigate *Artémise* having struck on them, extend 2 miles in a N.W. by N. direction from Mahaena pass, and then turn sharply westward for 2 miles to Onoheha pass; the soundings vary from 2 to 5 fathoms, except in a sort of pass about one mile eastward of Onoheha pass, where for some distance  $4\frac{1}{4}$  fathoms appears to be about the least depth over the barrier reef.

The eastern side of Motu Puuru in line with the western side of Nausouty islet S.S.E.  $\frac{3}{4}$  E. leads clear of the eastern side of these shoals, a close mark. See View C. on chart No. 1,382. The lighthouse on Venus point well open of Papenu point bearing West clears the northern side of the shoals. The lighthouse in line with Papenu point W.  $\frac{1}{2}$  N. touches the northern edge of the shoals.

*By night*, Venus point light is obscured when shut in behind Papenu point; it should therefore be kept well open of the land when in the neighbourhood of the Artémise shoals.

**Anapu channel** is the northern inshore channel from the Mahaena pass between the southern end of the Artémise shoal and Anapu point. Two banks Iore Rahi and Iore Iti, with from 13 to 18 feet water, lie in the southern entrance dividing the channel into three; the best channel is that nearest and  $1\frac{1}{2}$  cables from the shore of point Anapu; it is about one cable wide and leads into the large basin between the Artémise banks and the shore, and at its north-western end communicates with the Onoheha pass.

**CAUTION.**—Neither this nor any of the channels inside the reefs should be attempted except when the weather and other circumstances are such that the reefs can be clearly seen from the masthead.

**Onoheha pass** is a channel about 4 cables wide opposite the valley of that name, before mentioned; it has upwards of 50 fathoms in mid channel in the entrance between shoals with from  $2\frac{1}{2}$  to 5 fathoms on either

---

See charts, Nos. 1,382 and 1,158.

side. Mount Matotea a little open westward of the hills forming the eastern side of the valley S.S.W.  $\frac{1}{4}$  W. leads through the pass at one cable from the reef on the eastern side.

**North coast.**—From Faarumai valley, the coast trends W.N.W.  $2\frac{1}{2}$  miles to the low point Papenu, which extends 2 cables from the foot of the mountains; the mountains are steep to the coast for one mile to Utu Turoa point, and then recede, forming the valley Papenu, at the entrance to which is a plain 2 cables wide.

Beyond Papenu point, the coast trends westward nearly 4 miles to Venus point, described with its reefs and light at page 55. At  $1\frac{1}{2}$  miles from Papenu, the sandy beach is interrupted by a hill named Tapahi, of which the sea face is a perpendicular cliff; on the top of the hill is an old blockhouse.

**Faarumai pass**, about 2 cables wide, is opposite a valley of the same name, and about one mile from Onoheha pass. Inside the entrance, at  $2\frac{1}{2}$  cables from the shore, is a shoal on which there are only  $2\frac{3}{4}$  fathoms.

**Papenu pass**, at 2 miles N.W. of Faarumai pass, is 4 cables wide and about  $1\frac{1}{2}$  miles from the shore. A course steered S.S.W.  $\frac{1}{4}$  W. for the foot of the mountain forming the entrance of the valley on the western side leads through the pass. At the head of the valley will be seen the two peaks of mount Orohena.

**Maha Honu pass**,  $1\frac{1}{2}$  miles eastward of Venus point, is one cable wide and has from 20 to 34 fathoms between banks over which are from  $2\frac{1}{2}$  to 4 fathoms. Within the barrier shoals, there are from 17 to 8 and 10 fathoms, sand. A course steered S.E.  $\frac{1}{4}$  S. for the blockhouse on Tapahi hill leads through the pass.

**PORT MOTU AU.**—At nearly one mile East of the lighthouse on Venus point is the small wooded islet, Motu Au, less than 200 yards long W.N.W. and E.S.E. and lying about 300 yards from the shore, from which it is separated by a  $5\frac{1}{2}$ -fathoms channel. This islet is surrounded by a reef, awash, extending northward  $3\frac{3}{4}$  cables from the coast, and prolonged to  $4\frac{1}{2}$  cables to a depth of 5 fathoms.

Between this reef and the eastern part of Venus point reef, a pass  $2\frac{3}{4}$  cables wide and open to the northward gives access to a bay, at the head of which the small river Pupu, flowing from the Tuauru valley, discharges itself.

Anchorage may be obtained in depths up to 32 fathoms, sand, on a gentle slope. With easterly winds, there is tolerable anchorage near the reef of Motu Au, but it becomes dangerous when the winds are strong from N.E. to N.W. It is sometimes a very useful temporary anchorage



when strong westerly or south-westerly winds have made Matavai bay and the Papieté pass impracticable.

**MUREA, or Eimeo island.**—Murea island lies westward of Tahiti, the channel separating them being  $7\frac{1}{2}$  miles wide. Murea was discovered by Captain Wallis on July 27th 1767, and named by him Duke of York island; it has a more broken outline than even Tahiti, and its numerous peaks are more distinctly separated. The highest peak, mount Tohiva, in the southern part of the island, is 3,975 feet high, but many others in all parts of the island are between 2,000 and 3,000 feet in height. One of the most remarkable, mount Muaputa, has a hole completely through it near the summit, through which daylight may be seen on a south-easterly bearing.

The island is almost an equilateral triangle in shape, each side being about 9 miles in length, and the northern side taking about an E. by N. and W. by S. direction; it is surrounded by a barrier reef, through which are several passes to the basins between it and the shore. On the northern side are two deep indentations named Papetoai and Paopao bays, which afford snug and safe anchorage; these harbours are scarcely 2 miles apart, but between them rises mount Rotui with several peaks, the highest of which is 2,884 feet. At the head of the two harbours is a fertile plain, extensively cultivated, surrounding the southern foot of mount Rotui.

The island is thickly wooded though some of the peaks are bare, and at the foot of declivities the red ferruginous soil appears only to sustain a thick stunted growth, amongst which, however, the guava seems to flourish. Streams and watercourses are very numerous, but the only one of importance is that which drains the inner side of the mountains and runs into the head of Papetoai bay.

**Products, &c.**—At the north-eastern point of the island is Temae lake which abounds with excellent fish. Coffee, cotton, and sugar grow well, and tropical fruits abound. Fowls, goats and pigs are found wild in the mountains, the last-named attaining almost the size and nature of the wild boar. The population amounted, in 1892, to about 1,500, mostly protestant christians, but about 50 Chinese are employed on the plantation.

**Tides.**—As at Tahiti, high water occurs about mid-day, and low water morning and evening. The height of the water depends mainly on the state of the sea on the reefs. When it breaks heavily, the rise will be about 2 feet, and at such times the water rushes out through the various passes with great strength.

**Faapu point**, the eastern extreme of the island, is low and wooded, and extends more than half a mile from the foot of the mountains; the coast then trends N.W. by W.  $1\frac{3}{4}$  miles to Aroa point, where it turns W.S.W. for  $2\frac{1}{2}$  miles to the entrance of Paopao bay.

**Barrier reef.**—From Faaupo point to Aroa point, the barrier reef is so nearly united to the shore as to afford no inner channel even for boats. With this exception, it extends all round the coast at from 3 to 8 cables from the shore. Between Aroa point and Paopao bay are the two small passes, Ava-iti and Irihonu, leading into the enclosed basins. Neither of these passes should be attempted by a stranger, nor are they fit for anything but small local craft, the anchorage inside being in shallow water.

**Paopao bay,\*** also called Cook bay, is a narrow indentation in the land, on the northern side of the island, 5 cables wide and nearly  $1\frac{1}{2}$  miles long. The depth varies from 10 to 18 fathoms, mud, shoaling gradually towards the head of the bay, where there is a small river.

Avaroa pass is the channel through the reefs into this bay; it is  $1\frac{3}{4}$  cables wide and 4 cables long in a S.E. direction, and is safe in all weathers. When in the pass, the western reef is a little above water, but the eastern reef has about 6 feet over it. Mount Muaputa on a S.S.E.  $\frac{3}{4}$  E. bearing leads up to the pass.

The fringing reef does not extend more than half a cable from the beach, except off the eastern entrance point, where it projects about one cable; but between the fringing reef and barrier reef, on either side of the pass, is a narrow, deep, but blind channel, extending about 5 cables in each direction and communicating by boat channels only with the passes on each side.

The only danger within the bay is a small 3-feet patch half way up the bay and  $1\frac{1}{2}$  cables from the eastern shore. Good anchorage may be obtained almost everywhere, except in one or two places where the bottom is coral.

**Papetoai,\*** also called Teriu bay, is on the northern side of the island, about  $1\frac{1}{2}$  miles westward of Paopao bay, and penetrates 2 miles in a southerly direction; it is enclosed by precipitous mountains, rising in mount Rotai as before stated to a height of 2,884 feet. At the head of the bay is an extensive plain where the sugar cane is cultivated, known as the Opunhu plantation; a factory chimney and a large white house stand close to the beach.

This harbour has the advantage of being easy of ingress or egress during the ordinary trade wind; several streams fall into it, and that at the head was formerly navigable for large boats for a quarter of mile, where the water was quite fresh; it has, however, shoaled and only small boats can now enter.

The entrance to the harbour between the reefs is  $2\frac{1}{2}$  cables wide and clear of dangers, with the exception of a 2-fathoms patch lying well inside

\* See plans of Paopao and Papetoi bays, scale  $m=2\cdot0$  inches, on Admiralty chart, No. 1,382.

the eastern reef. The eastern side of the bay is quite clean, but on the western side a fringing reef extends from one to  $1\frac{1}{2}$  cables off-shore as far up the harbour as the little bay of Urufura; and there is a detached reef northward of Taiarii point, but well out of the way in sailing up the bay.

On the western side in the entrance is a passage round the land inside the barrier reef; here there is a landing place at the village of Papetoai where is the official residence of the French commandant.

To enter the bay, steer S.S.E.  $\frac{1}{4}$  E. for the white house of Opunhu which will lead through the pass and up to the head of the bay.

Anchorage may be obtained near the head in from 10 to 16 fathoms, mud, with  $1\frac{1}{2}$  cables of swinging room in all directions; landing can be effected in Urufura bay, or on beach at the head of Papetoai bay, but the swell sometimes rolls in at the latter place.

**North and West coasts.**—From Papetoai bay, the coast trends westward  $2\frac{1}{2}$  miles to Tehau point, off which, but within the reef, are the two wooded islets, Tiahura and Fareone; it is fronted by barrier reef at 3 cables from the shore. Taotoi pass, 2 miles westward of Papetoai pass with  $5\frac{1}{2}$  fathoms water and half a cable wide, leads through this reef opposite Tepee point, and into the interior basin on a South course. The current runs strongly out through this pass.

From Tehau point, the coast trends in a general S.E. direction 8 miles to Paroa point, the southern extreme of the island. The barrier reef is about 5 cables from the shore, and is broken by the four passes Taota, Avamotu, Matauvau, and Avarapa, of which the first two give access for small craft and boats only to the basins inside, but the last two are larger as now described.

**Matauvau pass** is more than one cable wide and has a depth of 8 fathoms; the southern reef is steep-to, but the northern reef has a shoal extending  $1\frac{1}{2}$  cables seaward which, however, does not narrow the pass which should be entered on a N.E. course; the peak of mount Muroa bearing N.E.  $\frac{3}{4}$  N. leads directly up to the entrance.

There is good open space for anchorage inside in from 7 to 16 fathoms, during the prevailing easterly winds; but these winds render it almost inaccessible to sailing vessels of large size on account of the squalls and baffling winds from the mountains. This anchorage is known as port Haapiti.

**Avarapa pass** is directly opposite point Tuarea. It is  $1\frac{1}{2}$  cables wide, but only 19 feet deep, the sea is generally heavy in this neighbourhood and the pass frequently impracticable. The vertical cliff on the western side of mount Tamarutofa bearing N.  $\frac{1}{4}$  E. leads up the middle of the pass and into Vairapa bay, where there is plenty of water, but the

shelter is not good, and there is no passage eastward or westward within the barrier reef except for boats.

**South and East coasts.**—From Paroa point, the coast trends E. by N. rather more than one mile to Nuupere point, which is low, and from thence to Faaupo, the eastern point of the island, the general direction is N.N.E. for  $6\frac{1}{2}$  miles, with several small bays backed by high and rugged mountains.

The barrier reef is about 5 cables from the shore, through which are the three passes, Teruaupu, Tupapaurau, and Vaiere, leading to the basins and channels within the reef.

**Teruaupu pass** is about  $1\frac{1}{4}$  miles north-eastward of Nuupere point and fronting the Haumi valley; it is deep,  $1\frac{1}{2}$  cables wide, and the reef on the southern side is steep-to; it leads into a basin which has from 20 to 25 fathoms, and extends to the southward with a gradually narrowing channel beyond Nuupere point, and to the northward beyond Poatuaho point, but in the northern part there are several dangerous coral banks with deep channels between.

This pass should be entered steering about W. by N.  $\frac{1}{4}$  N. and it opens out on both sides immediately within the outer reefs.

**Tupapaurau pass**,  $1\frac{1}{4}$  miles farther northward, is 2 cables wide, but has only a depth of  $3\frac{1}{4}$  fathoms in the deepest part. In heavy weather, the sea breaks right across, and in the finest weather it is only available for small schooners and boats.

The leading mark for this pass is a cascade seen between two mountains on with the protestant church, a large white building near the shore, bearing W. by N.  $\frac{1}{2}$  N.

Just northward of the Tupapaurau pass is the small wooded islet, Motu Ahi, standing on the barrier reef.

**Vaiere pass**, nearly 2 miles southward of Faaupo point, is one cable wide and 2 cables long; the reefs are steep-to on both sides and the water deep. On the reef on the southern side of the pass is the small low bare islet, Motu Pehue.

Inside this pass, which may with safety be entered in any weather on a W.  $\frac{1}{4}$  N. course, is a wide and deep basin, perfectly protected from the sea and affording anchorage in from 19 to 27 fathoms, mud.

The little bay of Vaiere faces the pass, and from this bay there is a pathway leading through the mountains to the northern valleys and the Opunhu plantation.

**CHANNEL between Murea and Tahiti.**—This channel should never be used by sailing ships except with steady winds from

North-east or South-west, as these are the only winds that blow through the channel. When there is a fresh breeze from the eastward to the northward of Tahiti it is generally calm in this channel, and vessels have remained becalmed here for days, whilst a fresh breeze prevailed to seaward. (See also "Local winds," page 54.)

The North-western coast of Tahiti should not be closely approached, as a portion of the westerly current striking against Murea is thrown back towards that part of Tahiti, and sets directly upon the barrier reef. The remaining portion usually turns south-westward down the coast of Murea; but the currents and eddies in this channel are very variable and uncertain.

At times, when there is a meeting of easterly and westerly winds in this channel, a heavy sea is raised, having the appearance of a line of breakers, this is dangerous for boats, especially off the eastern point of Murea island, against which the current sets, and which should under all circumstances be given a wide berth.

Steam-vessels from the South-west using this channel at night should make the light on Venus point after passing the southern point of Murea, before keeping to the eastward.

**TETIAROA** is an atoll resembling those of the Tuamotu group, on which are a number of small low islets with many cocoanut trees; the atoll is about 6 miles in length East and West by 3 miles in width, and lies 26 miles northward of Tahiti, its south-eastern point being in lat.  $17^{\circ} 6' S.$ , long.  $149^{\circ} 30' W.$  It consists of a reef, surrounding a lagoon, through which there is no pass affording an entrance, so that small boats or canoes wishing to enter must land on the reef and be hauled over it.

The islets are inhabited by a few natives, who rear pigs and collect considerable quantities of cocoanuts. Fish also are abundant.

**TUBUAI MANU**, also called Saunders island and Maio-iti by the natives, lies 41 miles W. by S. of Murea, and was discovered on the 28th July, 1767, by Captain Wallis; the greatest length from East to West is about 6 miles; at a distance it has much the appearance of a ship under sail. In the centre of the island is a hill with a double peak, the highest point being 780 feet above the sea. This hill is surrounded by a fertile plain and the lower ground abounds with cocoanut trees.

Tubuai Manu is surrounded by a barrier reef, awash, at about one mile from the shore, and on the southern side is a pass practicable for boats and small craft.

In 1892, the island had a population of about 200, who are under the district government of Hualheine.

**HUAHEINE**,\* the easternmost island of the Leeward group of the Society islands, was discovered by Cook in July 1769. It is about 20 miles in circumference and is divided into two at high water, the northern portion being named Huaheine Nui, and the southern portion Huaheine Iti; the isthmus connecting them is sufficiently covered at high water to form a boat passage. With south-easterly winds, the land is generally covered with clouds and hidden by rain squalls, especially during the night, when it is imprudent to approach it. In thick weather, the northern point is the best landfall.

The mountains attain an extreme height of 2,331 feet in Mount Turi in the northern section; they are of volcanic origin, green and partly wooded, especially the northern part. There is no continuous plain between the mountains and the shore, except in the North and North-west; but there is in most places a narrow strip of fertile land near the shore; the products are similar to those of Tahiti, but come earlier to perfection.

**Population.**—The inhabitants are of the same race and speak the same language as the Tahitians. In 1892, they numbered in all 1,300 persons, of whom a few were Europeans, and nearly all Protestants. The principal village, Faré, is on the north-western side of the island.

**Barrier reef.**—The entire island is surrounded by a barrier reef, but round the northern end, almost from the Farérea pass on the eastern side to Faré harbour in the North-west, the reef is more of the nature of a fringing reef, for it is so raised and connected with the shore as to have become *terra firma*, wooded almost to its exterior edge, and forming a cultivated plain. Between this plain and the original shores of the island are lagoons, which communicate with the sea on the N.E. by the Tiare pass.

On the western, southern, and south-eastern sides, the reef is of the true nature of a barrier reef, with several islands on it, and varies between being awash and having some 16 feet over it, its outer edge lying from 8 cables to 1½ miles from the shore. Through it there are five passes, three—the Araara, Farérea, and Tiare—on the eastern side; and two—the Avamoa and Avapeihi passes—on the western side.

**Farérea pass**, on the eastern side, about the middle of the island, is deep, and practicable for any class of ships; it leads into a good and very extensive anchorage in the large bay of Maroe, nearly 2 miles long and from 4 to 8 cables wide, with depths of from 12 to 22 fathoms.

Maroe bay communicates at high water by boat passage across the isthmus, as before mentioned, with port Bourayne on the western side of the island.

**Araara or South-east pass** is at the southern end of the island, between Tiva point and the island of Motu Araara, on the barrier reef to

\* See Admiralty chart :—Huaheine to Marua or Maupiti, No. 1,060.

the eastward. The pass has only a depth of 16 feet and is full of coral patches, on which the sea always breaks; it is considered dangerous even for very small craft. It communicates by boat channels inside the reefs with Farérea pass.

**Tiare or North-east pass** is deep but very narrow, and lies between the two wooded islands on the barrier reef, named Motu Pahare and Motu Vavara; it is the entrance to Faie bay, and also communicates by boat channel with the lagoons to the northward, and with Farérea pass to the southward.

**FARÉ AND HAAVAI HARBOURS.\***—These harbours are at the north-western end of the island. The two western passes, Avamoa and Avapeihi, both lead into them, and from them a deep water channel extends to within one mile of the southern point of Huaheine Iti. The principal entrance, Avamoa pass, is just southward of the N.W. point, and facing the village of Faré 7 cables within it; and Avapeihi pass, nearly one mile farther southward, is marked by a small wooded cay on its southern side, and is the most direct channel into Haavai bay or Cook's harbour, which extends with not less than 10 fathoms, upwards of one mile from the entrance.

The two passes are connected by a narrow but deep channel inside the barrier reef, awash, which separates their entrances.

**Avamoa pass** has central depths of from 15 to 20 fathoms, and as little as 10 fathoms in its widest part; it is  $1\frac{1}{2}$  cables wide between the reefs, which, however, are not steep-to, but shelve towards the channel reducing the width above a depth of 5 fathoms in one part to only 160 yards; there is also a small 6-foot bank southward of Teopape point, and but little more than half a cable northward of the mid-channel leading mark, which is a remarkable mountain at the head of Haamene valley in line with the beacon with white triangular top-mark on the beach, bearing S.E. by E.  $\frac{1}{2}$  E. This leads through the pass in about 10 fathoms least water. The beacon appears from the sea, when on the line for entering, about midway between the Queen's flagstaff on the left and the white Protestant church on the right.

Anchorage may be obtained in from 10 to 16 fathoms, mud, opposite Faré village. Large vessels should moor head and stern in the direction of the pass.

**Avapeihi pass** is straight, and has about the same width and depth as Avamoa, and like it, is accessible to the largest vessels at all times; the summit of mount Puuaretu bearing E.  $\frac{1}{2}$  S. leads directly through the pass, and when within 3 cables of Papatea point a vessel may keep away and

\* See chart, No 1,060; and plan on chart, No. 526; scale,  $m = 2\frac{1}{2}$  inches.

anchor in Haavai bay, or in the wide and deep channel extending to the southward between the barrier reef and the shore.

**Pilots** can be obtained for either pass if required.

Tidal influences are very slight here, the spring rise being only estimated at one foot.

The flagstaff in Faré village is in lat.  $16^{\circ} 42' 30''$  S., long.  $151^{\circ} 1' 12''$  W.

**Port Bourayne** is about one mile long by 7 cables wide, and is only separated from Maroe bay on the eastern side by the isthmus before described; it is 3 miles southward of Avapeihi pass and is approached by it and the deep inner channel between the barrier reef and the shore. In the entrance to the port is Vaiorea island with a channel on each side but that on its southern side would appear to be the best.

There is good anchorage in the port, which is quite free from dangers, in 15 or 16 fathoms.

The bays of Teapaa and Haapu lie 5 cables and  $1\frac{1}{2}$  miles respectively south-eastward of the entrance to port Bourayne and both are approachable by the deep but rapidly narrowing inner channel.

**RAIATEA AND TAHAA ISLANDS.**—These two islands lie about 20 miles westward of Huaheine and are only 2 miles apart. Together they occupy a space 23 miles in length N.N.W. and S.S.E. by an extreme width of 10 miles. They stand on one submarine base and are encircled by one barrier reef, broken by ten passes, of which eight lead into the anchorages of Raiatea, and two to those of Tahaa. Both islands are of volcanic origin, and Raiatea, the southern, is about double the size of Tahaa, the northern island.

**The Population** of the two islands amounted in 1892 to about 3,000; they are almost entirely protestant methodists.

**RAIATEA** is about 30 miles in circumference, of a mountainous character, covered with vegetation and well watered; the highest peak, in the middle of the island, is 3,389 feet high.

At from one to 2 miles from the shore is the coral barrier reef, of which the eastern and western sides in the gap between the islands curve inwards so as to approach each other to a distance of  $3\frac{1}{2}$  miles, enclosing a large space with much deep water, but with many large coral ledges and some islets. There are also several islets on different parts of the encircling reef, and between the reef and mainland are several excellent anchorages.



The principal articles of export are cotton (pressed into bales at a factory near Teavarua) and copra; but the greater part of the island, though most fertile, especially in the southern part, is not even under cultivation.

**Currents and Tides.**—The current near these islands generally sets to the N.W. at from 15 to 20 miles a day, sometimes less, and sometimes there is no perceptible current; but though its strength is so variable, it rarely sets to the eastward. Inside the reefs, the tidal streams are felt, the ebb generally stronger than the flood. The rise and fall of tide does not exceed one foot. The time of high and low water, and the direction of the tidal streams are much affected by the state of the sea, which, when heavy, runs over the reefs in large volumes. See page 16, &c.

**Teavarua harbour**,\* also called Uturoa, near the northern end and on the eastern side of Raiatea, is the port most frequented and one of the best anchorages. The village is the residence of the Queen and the seat of government; it extends a mile along the shore commencing nearly a mile northward of the pass; and the port is the space, about  $2\frac{1}{4}$  cables wide, between the barrier reef and the fringing reef. There are several piers extending from the shore, of which two have about 18 feet water at their heads.

Teavarua pass, called also Te Ava piti, consists of two principal entrances, the North and South passes, one on either side of Taoru, the southernmost of two islets covered with brushwood and cocoanut trees, and caution is necessary when entering as the tide sets across the channel at times; the flood setting N.W. and the ebb S.E.

The North pass is 130 yards wide and lies between the islands Tetaro and Taoru, 2 cables apart, the reef extending into the pass a considerable distance from both islands. Two beacons give the line of direction for this pass, W.  $\frac{3}{4}$  S.; the front beacon, with a rectangular top-mark, stands on a shoal in Tubua bay; the other, with a triangular top-mark on the beach of the bay. When in line, they lead through the centre of the pass but over a 6-fathoms patch in the entrance.

The South pass is 120 yards wide and lies between Taoru island and the southern barrier reef. Two small coral beacons in line S.W. give the direction; the front beacon is on a little islet, the rear beacon  $2\frac{1}{4}$  cables from it on the beach. This pass is not much used except by small sailing vessels.

**The Depth** of water inside the reef is from 18 to 24 fathoms, and the holding-ground is good. Thisé anchorage to the northward, off the village, is considered the best, and the channel up to it is  $1\frac{1}{4}$  cables wide

---

\* See Admiralty chart, No. 526; scale,  $m = 9\frac{1}{2}$  inches.

and clear of dangers. Two mooring buoys lie in mid-channel off American cove in steering for this anchorage; they belong to the German Commercial Society of Oceania who have a factory at this part; it is a large white building with a flagstaff near it.

There are passages out of Teavarua harbour to the northward and to the north-westward, inside the reefs, as presently described. That to the northward is called the Tahaa pass, and that to the north-westward the Motu Tabu pass. If bound westward, much distance and time are saved by the latter channel, but it should not be attempted without a good pilot.

**Regent point**, at the north-western part of the harbour, is in lat.  $16^{\circ} 43' 44''$  S., long.  $151^{\circ} 25' 54''$  W.

**Water.**—The best watering place is in a small bay S.W. of Taoru island, about  $1\frac{1}{2}$  miles from the anchorage. Small craft can go alongside a factory at the head of the bay, from whence water can be obtained with about 160 feet of hose.

**Supplies.**—Fresh meat, fish, and vegetables can be obtained.

**North coast.—Motu Tabu pass.**—From Regent point, the coast curves round westward for about  $1\frac{1}{2}$  miles to Motu Tabu, the low northern point of the island, off which is a detached patch marked by a beacon. A little farther northward is the Great Central reef, awash, about midway between the two barrier reefs and between the northern and southern ends of the two islands; the south-eastern end of this reef is also marked by a beacon, and the Motu Tabu pass is the channel between these two beacons. By it, vessels pass round to the Rautoanni pass and thence to sea; the whole channel is wide and deep enough for the largest vessels, see also page 94. H.M.S. *Cameleon* used it in 1885 and reported having found nothing less than 8 fathoms.

**Tahaa pass** leads up eastward of the Great Central bank and Tahaa island and inside the eastern barrier reef; it enables large vessels to proceed from Teavarua to Tahaa. It is  $1\frac{1}{2}$  cables wide at the narrowest part, and presents no difficulties as a coral beacon marks the south-eastern extreme of the Great Central bank, and another the western salient point of the eastern barrier reef. In the open space northward of the Great Central bank there is a shoal marked by a beacon on its north-western side.

**Iruru pass and Faaroa bay.\***—Iruru pass, on the eastern side of Raiatea, is  $3\frac{1}{4}$  miles south-eastward of the entrance to Teavarua harbour, and is barely a cable wide between the edges of the reefs, near each end of which are wooded islands. The leading mark is a small peak just to the left of the peak of Mau Fenua, 1,184 feet in height, in line with

---

\* See plan of Faaroa bay; scale,  $m = 3.0$  inches, on sheet No. 1,107.

the right hand sandy beach of the small islet Hinahuruvi S.W.  $\frac{3}{4}$  W. When through the pass, this islet should be left on the port hand, and a mid-channel course steered up the fiord-like bay of Faaroa, which recedes about 2 miles, has no central dangers, and for a width of about  $2\frac{1}{2}$  cables affords anchorage in from 16 to 8 fathoms, mud.

There is a deep water passage inside the barrier reef on both sides from this pass, but both have many coral patches; that leading to the northward is buoyed, the reef making off from Opeha point being marked by a black buoy, and a small 9-feet patch north-eastward of it by a red buoy; the channel lies between these two buoys. The passage to the southward and round the southern end of the island as far as Haaio island, opposite the entrance of the Nao Nao pass, is deep enough for the largest ships, but would have to be buoyed as it is most intricate.

**Teava Moa pass**,  $3\frac{1}{2}$  miles south-eastward of Iruru, is good but narrow, having a depth of about 22 fathoms, and leads to anchorage in Hotopuu and Toahiva bays; it also gives access to the deep water channels northward and southward inside the barrier reefs. The pass may be navigated by the eye as the reefs are awash and steep-to on both sides. A small islet scarcely above the water level is on the edge of the northern reef.

**Barrier reef.**—About one mile south-eastward of the Teava Moa pass, is the small island of Ontava near the outer edge of the barrier reef, which at this point turns to the southward for about 2 miles and then to S.W.  $\frac{1}{2}$  W. for 6 miles to the entrance of Nao Nao pass. There is no break in the whole of this length of reef and it varies from being nearly awash to having about 10 feet over it, as it does again from this pass round the south-western end of the island to the Punaeroa pass.

**Nao Nao pass**, just eastward of the wooded island of that name standing on the inner part of the barrier reef, is only 100 yards wide and is crossed by a narrow bar with only 22 feet water, causing the sea to break heavily completely across in bad weather. Immediately inside, it opens out into a fine open space with good anchorage anywhere around Haaio island; nevertheless, from the nature of the entrance, this pass can only be considered fit for small craft in fine weather.

The passage inside the reefs between the Nao Nao and Punaeroa passes is barred to all but boats and very small craft by coral reefs with from 3 to 18 feet over them, especially between Putete point and the western side of Tuuroto bay, after which it again opens out into a good channel to the northward.

**Punaeroa pass** on the south-western side of Raiatea is good, and leads to an extensive anchorage in 15 fathoms, mud. It is  $1\frac{1}{2}$  cables wide, has a least depth of 29 feet on the leading line and with the prevailing easterly winds the sea is generally smooth. To make and enter the

---

See plan on sheet, No. 1,107.

pass, steer N.E. by E.  $\frac{1}{2}$  E., with the vertical western fall of the mountain called the South summit on with a smaller summit visible below it.

**Taomaro pass**,  $2\frac{1}{2}$  miles northward of that last described, is a good channel 160 yards wide between two wooded islets, having a depth of 9 fathoms. It leads to good and safe anchorage inside the reefs; also to the little port of Vaiacho, and by a deep and intricate channel, communicates with the pass to the southward, but not to the northward.

**Tiano pass** communicates with Tetoroa bay, but is a cul-de-sac having no connection with the passes northward or southward of it. The pass is both difficult and dangerous, and is not recommended.

**Rautoanui pass\* and Pufau bay.**—The entrance by Rautoanui pass on the western side of Raiatea is formed by a gap in the barrier reef about 2 cables wide, but as shoal water of only from 6 to 12 feet extends half a cable from each reef into the channel, the navigable width is rather less than one cable. On the inner side of the northern barrier reef is the small wooded island Tabu-Nahoe, and on the southern barrier reef, the sandy islet Torea. The general direction of the pass is E. by N.  $\frac{1}{4}$  N. and the anchoring depth from 20 to 24 fathoms, soft mud.

**Beacons.**—A conical beacon stands at the south-eastern or inner edge of the barrier reef, just eastward of Tahu Nahoe island. Two leading beacons are thus placed:—The front beacon on the outer edge of the fringing reef at Mirimiri point, and the rear beacon on that point; when in line E. by N.  $\frac{1}{2}$  N. they lead through the middle of the pass. To approach the pass from the south-westward until these beacons are made out, a good leading mark is, the western tangent of mount Tapioi, the northernmost peak of the island, in line with the eastern tangent of the island Tahu Nahoe N.E.  $\frac{3}{4}$  E.

There is a deep water but very intricate channel for  $3\frac{1}{2}$  miles to the southward inside the barrier reef; it communicates eventually with the Tiano pass, but can only be used by those with good local knowledge.

On the southern side of Mirimiri point is Pufau bay, affording a very confined anchorage with muddy bottom.

The inner channel to the northward is that used, as before described, in connection with the Motu Tabu pass by vessels passing round the northern end of Raiatea. Its narrowest part is off Tenape point, and here the salient point of the fringing reef is marked, as are several salient points on both sides, by a conical beacon. These beacons are built of coral and are all about 6 feet above the water level.

---

\* See plan of Rautoanui pass; scale,  $m = 3\cdot0$  inches, on sheet No. 1,107.

**TAHAA**, about 2 miles northward of Raiatea and within the same barrier reef, is about half the size of that island, nearly circular, and not so fertile. The highest peak, mount Ohiri, is 1,936 feet high.

Small islands on the outer edge of the barrier reef surround its northern side in great numbers, many of them wooded, and the reef generally is full of coral patches, some almost awash, and in other parts with 10 or 12 feet over it.

There are two passes only through this barrier reef into the enclosed basins, that of Toahotu on the eastern side, and Paipai on the south-western side of the island; but there is a practicable deep-water channel completely round the island inside the barrier reef, and only rendered intricate in one part, viz., at the northern end, by detached mid-channel reefs.

**Toahotu pass**,\*  $1\frac{1}{2}$  cables wide, is deep and clear of dangers, and may be recognised by the two islets Mahea and Toahotu on the northern and southern reefs respectively. Inside and southward of the pass is Hamene bay, and northward of it Tenoeroa-haaoa bay in both of which good anchorage may be obtained in from 16 to 25 fathoms.

The leading mark for this pass is, mount Puraui on with a remarkable hill on Pataia point W. by N.  $\frac{1}{3}$  N.; see view on plan. This line leads over patches of 19 feet within the pass.

**Tahaa**, the principal village, is built on the south-eastern point of the island, about 2 miles southward of Hamene bay; good anchorage may be obtained off it in from 16 to 22 fathoms, mud, good holding-ground.

The best anchorage is in the direction of the prolongation of the pier with Toamara point in line with Fatu Fatu, a low rocky islet to the southward of the village. Near Fatu Fatu the holding-ground is not so good.

The village may be recognised by a church and flagstaff.

**Paipai pass**,† on the south-western side of the island, is  $1\frac{1}{2}$  cables wide and 5 cables long in a N. by E. direction, and is deep and clear of dangers. The leading mark up to the pass is, the first ravine westward of mount Puraui on with Teamahama point N.N.E.  $\frac{2}{3}$  E., see view on plan. As the pass is entered, a vessel requires to haul up to North, direct for Pari point, until through the pass.

Anchorage may be obtained in Hurepiti bay in from 20 to 25 fathoms.

**BORA BORA**,‡ always spoken of as one island is in fact two, the western and smallest island being named Tupua island and a barrier reef encircling both. Bora Bora lies about 10 miles N.W. of Tahaa. The barrier reef around the eastern, northern and part of the western side is

\* See plan of Hamene bay; scale,  $m = 3.0$  inches, on sheet No. 1,107.

† See plan of Hurepiti bay; scale,  $m = 3.0$  inches, on sheet No. 1,107.

‡ See plan of Bora Bora, No. 1,428; scale,  $m = 3.3$  inches. Also, chart No. 1,060.

covered with islets, mostly wooded, and much larger than those on the reef surrounding Raiatea and Tahaa; on the south-western and southern sides the reef has no islands, but varies in depth from nearly awash to about 10 feet; it is nowhere more than  $1\frac{1}{2}$  miles from the shore, and on it the sea breaks heavily.

Bora Bora is distinguished by a double peaked mountain named Pahia, 2,165 feet above the sea, in the centre, *see* view on plan, and 550 yards eastward of it is mount Temanu, 2,379 feet high. The island is generally more craggy than the rest of the Society islands. The eastern side has a barren appearance, the western is more fertile; a low plain which surrounds the whole, together with the islands on the reef, contain a numerous population, computed, in 1892, at 600; they are of the Tahitian race, speak the same language and profess Protestantism.

**Teavanui pass and harbour.**—Teavanui harbour on the western side, between Bora Bora and Tupua, is  $1\frac{1}{2}$  miles long N.W. and S.E. and averages one mile in width, is well sheltered and commodious, and affords anchorage in from 12 to 16 fathoms, sand and mud.

The large village of Vaitape lines the shore on the eastern side of the entrance to the harbour. The queen's house, a large European structure, and a flagstaff, with a church and landing pier close by, occupy a prominent central position. The flagstaff is in lat.  $16^{\circ} 30\frac{1}{2}'$  S., long.  $151^{\circ} 45' 7''$  W.

The pass through the reef is 2 cables wide, 4 cables long, and has  $5\frac{1}{2}$  fathoms water; it is straight and free from danger. The wind being generally from the East blows out of the pass, and the stream generally sets out in strength proportionate to the amount of surf rushing over the reefs.

**Beacons.**—The following beacons have been placed as guides for the pass:—

**Leading beacons.**—The front beacon, with a rectangular top-mark, stands on the beach at the southern side of Pahua point.—The rear beacon, with a triangular top-mark, S.  $83^{\circ} 30'$  E. 1,155 yards from the front beacon.

About  $2\frac{3}{4}$  cables farther southward is a coral beacon on the edge of the fringing reef off the village of Vaitape.

To enter, bring the leading beacons to bear E.  $\frac{5}{8}$  S., and steer in on that course, which will lead through in mid-channel in  $5\frac{1}{2}$  fathoms least water until the coral beacon off Vaitape is on with a small peak 761 feet high, bearing E. by S.  $\frac{5}{8}$  S., when steer on that line until nearly abreast of the outer leading beacon; then haul to the southward and anchor anywhere in the harbour or off the village. A good berth is with the church bearing N.E. by E.  $\frac{1}{4}$  E. and Pahua point N.N.W.  $\frac{2}{3}$  W.

A shoal extends 4 cables off the northern end of Tupua island towards the pass which renders it necessary to observe the leading lines given, and the northern shore may be approached with safety to about one cable.

The edges of the reefs are clearly visible, but with strong north-westerly winds the sea breaks right across the entrance, rendering it difficult to distinguish the channel; at such times it is inadvisable to enter without a pilot or good local knowledge.

There is also anchorage in Fanui bay northward of Pahua point, and a deep water channel inside the reefs round the northern end of the island as far as the north-eastern point where it is blocked by reefs, as it is also at the southern end at Matira point; boats only can pass completely round.

Pilots may be obtained if desired; they bring a copy of the port regulations with them.

**MOTU ITI** or Tubai, about 8 miles N.N.W. of Bora Bora, consists of several small and low islands connected by a reef without any opening. Turtle are said to abound here, and it is much resorted to by the natives of the neighbouring islands for fishing purposes, and to collect cocoanuts, but it is not permanently inhabited.

The islands occupy a space about 4 miles in extent in each direction, and the reefs do not appear to extend more than a mile from them except to the northward, where they are reported to be as much as 4 miles from the land; the extreme North point of the reef being approximately in lat.  $16^{\circ} 11' S.$ , long.  $151^{\circ} 48' W.$

**MARUA**, also called Maupiti, lies about 23 miles westward of Bora Bora; it is about 6 miles in circumference, small, with a population of about 300, and comparatively high, the highest point being 800 feet above the sea. It is surrounded by a barrier reef on which and enclosed by which are numerous small islets covered with cocoanut trees. The reef extends nearly 2 miles from the main island on all sides except to the southward where it extends  $3\frac{1}{2}$  miles. All the northern outer part of the reef from East to West is well above water and thickly wooded; the southern, except for a few islets, is mostly awash.

The entrance to the lagoon within the barrier reef is at the southern end between two small low islets, covered with trees, which bear S.S.E. from a very remarkable perpendicular rocky bluff, 700 feet high, resembling the ruins of a gigantic castle, on the South side of the island.

**Depth, &c.**—The channel between the islets is narrow and winding, there are 6 fathoms in the entrance, but within, it quickly decreases to 4 fathoms, and in the lagoon, which is largely occupied by coral reefs, there are only from 15 to 18 feet. In bad weather the sea breaks right across the entrance, and it is only fit for small craft in fine weather, great care is even then necessary on account of rollers. A strong current always sets out at the entrance, and is, as usual, strongest when the surf is heaviest.

The centre of the island is in lat.  $16^{\circ} 26\frac{1}{2}' S.$ , long.  $152^{\circ} 12' W.$

**MOPEHÁ,\*** about 100 miles W.S.W. from Marua, is an atoll and was discovered by Wallis in 1767, and called by him Lord Howe island; it is also known by the name Mopelia. The atoll was visited and surveyed by Lieutenant de Vaisseau Lavenir of the French navy in 1893, who fixed the observation spot, *see* plan, near the northern edge of the reef as in latitude  $16^{\circ} 48' S.$ , longitude  $153^{\circ} 55\frac{1}{4}' W.$

Mopéhá consists of many low islands on a reef surrounding a lagoon, and occupying a space 10 miles long North and South, and 4 miles wide. The whole eastern side of the reef is occupied by a long narrow band of dry land with many cocoanut trees. On the northern and western sides are numerous islets, many of them with brushwood or trees of various sorts. The only pass through the barrier reef is on the north-western side, it is only about 80 yards wide, steep-to, and with a depth of 32 feet; but its inner part is almost closed by shoals, so that a small sailing vessel requires to furl sails and warp through into the open water of the lagoon, and this can only be done by sending two boats on ahead with kedge anchors and hawsers to await the vessel's arrival. The lagoon has plenty of water, but also some shoals easily discernible by the eye; it cannot, however, be considered as ordinarily accessible even to the smallest vessels without the greatest care and thorough knowledge of the pass.

The islands are without permanent inhabitants, though Lieutenant Lavenir found two huts and many graves on one of the islands, and they are now frequently visited by fishermen for the purpose of catching turtle, which abound.

**FENUA URA**, or Scilly islands, is an atoll on which is a group of small, low, and consequently dangerous islands, discovered by Wallis in 1767. They are about 43 miles north-westward of Mopéhá, and 140 miles westward of Marua and are uninhabited. The centre of the group is charted in lat.  $16^{\circ} 31' S.$ , long.  $154^{\circ} 43' W.$  (approximate). The atoll is about 6 or 7 miles in diameter, and the enclosed lagoon has no pass by which it can be entered.

**Current.**—Between Mopéhá and Fenua Ura islands, in 1875, the *Unkel Breasig*, Captain Scheibner, experienced a current of 11 miles in 24 hours to windward, the wind at the time being N.N.E., force 7 to 8.

**BELLINGSHAUSEN ISLAND**, another atoll, was discovered by Kotzebue in 1824; it consists of four low coral uninhabited islands, covered with cocoanut trees and other vegetation on a reef of triangular form; the greatest length of the atoll is about 3 miles in a N. by E. and S. by W. direction. It is about 35 miles N. by E. from Fenua Ura in lat.  $15^{\circ} 48' S.$ , long.  $154^{\circ} 33' W.$

---

\* See chart, No. 1,060; and plan of Mopéhá anchorage, 1,107; also chart, No. 783.



The reef is steep-to all around, and has a number of large boulders on it. About a dozen cocoanut trees show conspicuously above the others and may be seen 10 miles distant. There is no opening into the lagoon, but the sea flows into it over the reef.

Landing may be effected in fine weather without danger on the W.N.W. or lee side of the islands.

## CHAPTER IV.

RAPA NUI.—SALA Y GOMEZ ISLAND.—TUAMOTU OR  
LOW ARCHIPELAGO.

## VARIATION IN 1900.

---

Rapa Nui -	-	- 12° E.	Anaa islands -	- 8° E.
Manga Reva -	-	- 9° E.	Disappointment islands -	- 7½° E.

---

**RAPA NUI or EASTER ISLAND.\***—Rapa Nui, generally known as Easter island, was discovered by the Dutch admiral Roggewein on Easter Sunday 1721. Cook and La Perouse both visited the island, which was subsequently surveyed by Captain Beechey, H.M.S. *Blossom*, in 1825, and again by Officers of the Chilian Government in 1870.

The island was formally annexed to Chile in July 1888, and in August 1889, when visited by H.M.S. *Cormorant*, the inhabitants comprised the Chilian governor and seven others, and 180 natives. It had then a large stock of cattle, sheep, and pigs, also poultry, mostly running wild, and plenty of horses.

Easter island is volcanic and has numerous craters, none of which have been active for many years. It is of much interest, on account of the colossal ancient statuary sculptured in lava by former inhabitants; and being 2,030 miles from the coast of Chile and 1,500 from the nearest inhabited island, except Pitcairn island, the problem as to how, in so isolated a position, it ever became inhabited, has not yet been solved.

Until the visit of H.M.S. *Sappho*, in 1882, it was generally supposed from vague native tradition that inhabitants had originally come in a large canoe from Rapa island, which does not seem probable, as that island is 1,900 miles to the westward, and no canoe could navigate that distance against the usual trade wind. Mr. Alexander Salmon, the agent for the British commercial house of the Maison Brander of Tahiti, who speaks the native language fluently, furnished Commander Clark, of the *Sappho*, with a more reliable account of native tradition on this subject. The belief is general amongst them that they originally came from the East in two canoes provisioned with yams, taro, and sweet potatoes; the king (by name "Hotu metua" or the "Prolific Father") in one canoe, and the queen in the other. On making the island they separated, passing round

---

\* See Admiralty plan :—Easter island, No. 1,386; scale,  $m = 1 \cdot 15$  inches.

in opposite directions and meeting again at Anakena, on the North side, where they landed, and settled on mount Hotu-iti. There they built the stone houses, the remains of which still exist, and carved the statues with which the hill is covered; but the first statue was not completed until about fifty years after they landed. The original name of the island was *Te pito fenua*, i.e., the land in the middle of the sea.

In 1863, some Peruvian vessels arrived off the island and carried a number of the inhabitants away to work on their guano islands; in the following year, some Roman Catholic missionaries settled in the island to protect and civilize the remainder, who only numbered about 1,500, and rapidly decreased, so that in 1867 only 900 remained.

In 1878, the *Maison Brander* firm, which had been trading with the island for some years, removed about 500 of the inhabitants to work on their sugar plantations at Tahiti, and purchased the property of the missionaries on Easter island, who then went with about 300 of the natives to Manga Reva; so that at the time of the *Sappho's* visit there were only about 150 inhabitants left.

The natives somewhat resemble the Marquesans, being of a light complexion, and are rather a handsome race. There is a resident native missionary, and they are visited by a priest from Tahiti.

The statues, some of colossal size, which are scattered over the island in great numbers, are most remarkable; they vary in height from 5 to 37 feet, but are usually from 15 to 18 feet high. They are all sculptured from a grey compact lava found in the crater of Hotu-iti, near the eastern end of the island, where there are still many in an unfinished state. Their shape is that of the human trunk, terminating at the hips, the arms close to the sides, the hands in low relief clasping the hips. The head is flat, and the top of the forehead cut off level, to allow of the crown being placed in position; this latter is made of red tuff found in Rano Kao crater. The face is square, massive, and sternly disdainful in expression, the aspect always upwards.

Easter island is triangular in shape, and about 29 miles in circumference; from South-west cape to cape Roggewein, the south-eastern extreme, the distance is 12 miles nearly; from thence to North cape 9 miles; and from North cape to South-west cape, 8 miles. The highest part is Rana Hana Kana or La Perouse mountain, with a crater, near North cape; it is 1,767 feet high. All the hills are smooth, rounded, and green to the summit, but there are no trees.

The coast is rocky, and there are only two or three sandy beaches in all its extent. On the northern and southern sides the land is high and precipitous.

Near South-west cape is Rana Kao, the largest crater; the mountain is 1,327 feet high, and after descending inside the crater for 600 or 700 feet, it is  $2\frac{1}{2}$  miles in circumference. At the bottom of this crater is a small lake, covered with decayed vegetable matter, and Mr. Salmon stated that he had failed to obtain bottom in it with 50 fathoms of line.

Hotu-iti, or mount Topaze, about 680 feet high, is another isolated crater in the south-eastern part of the island; from the grey lava of which its sides are composed, the statues previously described were made.

Off South-west cape are two rocks, Mutu Raukau or Needle rock, and Mutu Nui or Flat rock, with deep water between them and the main island. H.M.S. *Sappho* made use of the inner passage on the way to Hanga Roa, and reported them both clear of dangers.

**Anchorage.**—There is no sheltered anchorage anywhere round the island, but as its shores are bordered by soundings of from 25 to 35 fathoms extending from one mile to  $1\frac{1}{2}$  miles from the land, with sandy bottom and occasional rocky patches, the bottom sloping gradually towards the shore, it is not difficult to pick up a temporary anchorage anywhere on the lee side of the island; and in fine weather it generally falls calm near the land during the night.

**Landings.**—There are six landing places—Hanga Roa and Hanga Piko on the West, La Perouse bay and Anakena on the North, and Vahio and Hutuiti on the South; so that a ship can communicate at any time. There are no inhabitants at La Perouse bay, but at Hanga Roa and at Vahio there are Roman Catholic mission stations.

**Hanga Roa, or Cook bay,\*** on the West coast, is a small bay about one mile wide between Cook point and Punta Roa, and affords good anchorage from October to April, the season of the trades; during the remainder of the year it is often a lee shore. H.M.S. *Sappho* anchored in 14 fathoms, with the village bearing E. by S., and Punta Roa S. by W.; but the best anchorage is outside the 16-fathoms line, for, inside that depth, the bottom is very hard, and nearer the shore there are large boulders.

The landing in this bay is not very good, the water being shallow inshore, with a rocky bottom, but it is quite safe in fine weather.

The observation place at the Mission house is in lat.  $27^{\circ} 10' S.$ , long.  $109^{\circ} 26' W.$

**Hanga Piko**, the bay next southward of Hanga Roa, affords excellent landing; but the channel in between the rocks is rather narrow, and, with any swell on, the breakers are rather alarming; however, it never breaks right across, except in a gale, and the passage

---

\* See plan:—Cook bay; scale,  $m = 5.0$  inches, on No. 1,386.

was improved by the officers of the *Sappho*, who blew up a rock which jutted into the channel on the southern side.

**Supplies.**—The island having been leased by the Chilian Government to one Julio Merlet for stock raising purposes, it has become an excellent place for obtaining live stock. Captain Lourison, of the ship *Eaton Hall*, who visited it in October 1895, speaks of it as an admirable place for a California bound ship to touch at for supplies. He states that the island then had some 30,000 sheep, 5,000 head of cattle, and 1,500 horses and mules. Beef, mutton, and poultry can be easily obtained only at Hanga Roa or Cook bay; sheep, averaging 60lbs. in weight, cost about 3 dollars each. Vegetables are rather scarce at short notice, but yams, sweet potatoes, bananas, and plantains grow in abundance, and can be obtained if time is given.

**Water** is scarce, but there is a well of excellent water on the hill at the back of the Mission house near Hanga Roa, called Puna Pau or "the unfailing spring." It is a curious fact, that when a heavy swell prevails on the western side of the island, the water rises in this well although remaining perfectly fresh.

**Winds.**—From October to April, the S.E. trade is constant at Easter island, blowing strongly at its commencement and termination. There are occasional showers during the trade season. From May to September, the weather is variable, westerly winds prevailing, at which season there is a good deal of rain.

Thunder and lightning appear to be unknown.

**Tides.**—It is high water, full and change, at 0hr. 39m.; rise, about 6 feet.

**SALA Y GOMEZ ISLAND.\***—This island was discovered in 1793 by the Spanish commander of that name, and was again visited by the Spaniards in 1805. It is scarcely more than a heap of stones less than half a mile long in a N.W. and S.E. direction, and 2 cables wide. In a gale, it would hardly be distinguishable amidst the spray; the highest part at the south-eastern end is 98 feet high. The rocks, except such parts as sea birds frequent, are of a dark brown colour.

Some sunken rocks lie off the north-eastern and south-western points.

The North-west point is in lat.  $26^{\circ} 27\frac{1}{4}'$  S., long.  $105^{\circ} 28' W.$  (approximate).

**Tides.**—It is high water, full and change, at 4 hrs.; rise about 4 feet.

**Scott reef**, on which the sea breaks, lies about one mile N.E.  $\frac{1}{4}$  N. from Sala y Gomez. It is 100 yards long, East and West, and 50 yards

\* See Admiralty plan :—Sala y Gomez on No. 1,386; scale,  $m = 2\frac{2}{3}$  inches.

wide, with from 16 to 19 fathoms close around, increasing to 40 fathoms at  $2\frac{1}{2}$  cables from the reef except in the direction of the island, between which and it are depths of from 16 to 33 fathoms.

### TUAMOTU OR LOW ARCHIPELAGO.\*

This vast group, comprising 78 islands, of which the native name until recently was the Paumotu or Submissive islands, which name was given them by the Tahitians after conquest, has now by the desire of the inhabitants been officially re-named the Tuamotu archipelago or Distant islands. The group extends over fifteen degrees of longitude, not including the detached islands to the south-eastward. The islands, with the exception of Makatea and Tikei, are all atolls, very similar in character and with great sameness of feature.

With the exception of the south-eastern detached islands, Ducie, Henderson, Pitcairn, and Oeno, the whole group was annexed to France in 1880. The seat of government is at Rotoava village on Fakarava island.

In consequence of the extent of the archipelago, and the character of the islands composing it, they were naturally discovered only by slow degrees and by many different navigators, whose voyages extended over a long series of years.

The first who gave any notice of their existence was Quiros, the Spanish navigator, who, in 1606, saw several islands on the northern and southern sides of the group. Le Maire and Schouten, in 1616, discovered several in the northern part, and Roggewein also passed the northern part in 1722. Subsequently to this Bougainville (1763), Byron (1765), Wallis and Carteret (1767), Cook (1769, 1773, 1774), Bonecheo (1772-1774), Edwards (1791), Bligh (1792), Wilson (1797), and Turnbull in 1803, all made additions in the history of discovery.

More exact observations were then made by Kotzebue (1816), Bellingshausen (1819), and Duperré (1823).

Beechey (1826), Fitz-Roy (1835), and Wilkes (1841) gave more accurate descriptions; and since that period the French have made many observations as to position and character, and from them we derive most of the subsequent details.

**Population.**—The inhabitants of the whole group under France amounted in 1892 to 4,743 in number. They are not all of the same origin; some resemble the Fijians in figure and in the darkness of their skins; others more resemble the Tahitians, but have a more warlike disposition, and apparently speak a different dialect of the Polynesian

---

\* See Admiralty charts:—Pacific ocean, general, No. 2,683. Pacific ocean, S.E. sheet, No. 783. Tuamotu or Low archipelago, No. 767.

language to that of Tahiti. These natives are reported to be honest and trustworthy, and have nearly all been converted to the Protestant form of Christianity. The French Roman Catholics have an establishment in Anaa, another at Manga Reva, and at other places as hereafter detailed.

Most of the islands are inhabited, but in many, the population is extremely variable; the people deserting one island, when the pearl fishery is temporarily suspended, and establishing themselves on another with the greatest facility. The most venturesome navigators are those belonging to Anaa or Chain island. Their vessels are double canoes about 35 feet long, connected by a strong framework, which hoists two mat sails on separate masts. They do not care to serve for pay in schooners or larger vessels, and show no aptitude for the sailing of such craft. Many of them are expert divers.

The trade of the Tuamotu islands is carried on by merchants of Tahiti, principally British and American, and the commerce is greater than might be supposed. Owing to the steady cultivation of cocoanut trees, a great increase in the quantity and value of copra exported has taken place of late years; this and pearl shell are the principal articles of trade, and a large number of schooners and smaller vessels are constantly passing and repassing amongst the islands collecting the produce.

**Winds.**—These islands lie within the boundary of the regular trade wind, which, except amongst them, blows with fair regularity the whole width of the Pacific, but from causes not quite satisfactorily accounted for, the land here, though small in area and inconsiderable in height, exercises such an influence as to interrupt the regularity of the trade wind, so that not only does its easterly direction often fail, but heavy squalls from the opposite direction occur, and more frequently by night than by day. This is especially the case from November to March\*; see also pages 10 and 50.

The effect of the prevalent south-westerly gales in high southern latitudes in transmitting the heavy sea which is felt many hundreds of miles from the latitudes of its origin, occasions a serious obstacle to landing on these low islands, by rolling in on the shore in an opposite direction to the trade wind, making it often more dangerous to land on the lee than on the weather side of the islands.

In September 1877 and February 1878, two hurricanes occurred among the islands of the Low archipelago. They are the first on record, and are reported to have caused much damage among the Manihi or Waterland

---

See chart, No. 767.

\* It is said that the regularity of the trade wind is largely influenced over this archipelago by the evaporation caused by solar heat on the shallow confined waters of the lagoons. The wind is certainly most regular when the power of the sun is least; that is to say in June, July, August, and September.—E. H. H.

islands, King George islands, Kaukura or Aura islands, Fakarava or Wittgenstein islands, and Anaa or Chain islands.

The sea is reported to have washed completely across Niau or Greig islands, destroying nearly all the inhabitants.

Exceptionally severe weather, accompanied by strong north-westerly winds, was experienced by H.M.S. *Alert* towards the end of July 1880, in the vicinity, but southward of, the Tuamotu archipelago. It was afterwards ascertained that at about the same time similar winds and weather were prevailing as far westward in the South Pacific as Tahiti.

**Tides.**—In most of the entrances to the lagoons in these atolls, there is a strong tidal stream which sets in and out alternately about 6 hours each way, the rise of tide being about 2 feet. It is high water, full and change, at about 1 h. among the western groups, and from half an hour to one hour later among those to the south-eastward.

**Currents.**—As might be supposed, amongst such a large mass of islands the currents are somewhat irregular, but during settled weather, and a steady South-east trade wind, the surface water generally moves westward from 5 to 25 miles a day. In the rainy season, from October to March, when westerly winds, squalls, and rains are frequent, the currents vary most, and occasionally set to the eastward from half a mile to 2 miles an hour.

South-eastward of the Tuamotu group proper lie the four south-eastern islands, Ducie, Henderson, Pitcairn, and Oeno, which, from their positions, will be first described.

**DUCIE ISLAND,\*** in lat.  $24^{\circ} 40' S.$ , long.  $124^{\circ} 48' W.$  approximately, was discovered by Captain Edwards, H.M.S. *Pandora*, in 1791. It is an atoll of coral formation,  $1\frac{3}{4}$  miles long, N.E. and S.W., and one mile wide.

The lagoon in the interior is partly enclosed by trees and partly by low coral flats scarcely above the water's edge; the lagoon appears to be deep and had a boat entrance on the south-eastern side, but, in 1882, a sandy ridge extending right across the bar, with a heavy surf, completely blocked the entrance.

The height of the soil above the water is about 12 feet, and the trees about 14 feet more, making the tops of the trees about 26 feet above the sea.

No living things but birds were seen on the island, and great numbers of fish and sharks abound in the vicinity.

In 1882, the hull of the *Arcadia*, a large vessel wrecked there in June 1881, was lying on the north-western side, and in 1897 when visited by

---

\* See chart, No. 783. Also plan of Ducie island; on sheet of plans, No. 1,176.



H.M.S. *Comus* the remains of apparently the same wreck were still visible.

Though the wind was from the North, force 4, a boat was enabled to land on the northern side, but it was necessary to wade as the coral beach runs out shallow.

Breakers extend half a mile southward of the island.

**HENDERSON ISLAND**,\* also called Elizabeth island, about 190 miles W.  $\frac{1}{2}$  N. from Ducie island, and in lat.  $24^{\circ} 25' S.$ , long.  $128^{\circ} 19' W.$ , was discovered by a boat's crew from the whaler *Essex*, which was wrecked in 1820; it was afterwards seen by Captain Henderson of the ship *Hercules*. According to Captain Beechey, the island is 5 miles long, North and South,  $2\frac{1}{2}$  miles wide near the northern end, but tapering off to a point towards the South, and has a flat surface nearly 80 feet above the sea. On all sides except the North it is bounded by perpendicular cliffs about 50 feet high, composed entirely of dead coral, which are considerably undermined by the action of the waves. It appears to be steep-to at a short distance all round.

The island presents the appearance of having been raised by some subterraneous convulsion, and is so thickly interlaced by shrubs as to make it very difficult to walk over the summit, the vegetation concealing the cavities in the coral.

There is no spring of fresh water, but rain water sufficient to sustain the two men of the *Essex* who were eventually rescued from the island, was found in small pools.

Landing is extremely difficult on account of the heavy sea rolling in on the coral ledges.

**PITCAIRN ISLAND**† is a British settlement; it was discovered and named by Carteret on 2nd July 1767. The island derives its interest from being associated with the mutiny of H.M.S. *Bounty* in 1789. That vessel left England in December 1787, with the object of conveying bread-fruit trees to the West India islands from Tahiti, where she arrived in October 1788, and remained six months collecting trees. The mutiny occurred at sea on 28th April 1789, when the Lieutenant in Command (Mr. Bligh, afterwards Governor of New South Wales) and 18 others were set adrift in the launch (23 feet long), in which boat they made their way to Coepang in Timor in 42 days, a distance of upwards of 3,600 miles, where they all arrived alive after enduring intense hardship and suffering.

Mr. Christian, Master's mate, three Midshipmen, and 21 others remained with the *Bounty*.

\* See chart, No. 783. Also plan of Henderson island; on sheet of plans, No. 1,176.

† See Admiralty plan:—Pitcairn island, No. 1,113; scale,  $m = 6.0$  inches.

After the mutineers had set Bligh and the rest of the crew adrift they bore away in the *Bounty*, intending to return to Tahiti, but first reaching Tubuai, attempted to settle there, but were obliged to leave on account of quarrels with the natives; this was the first intelligence gained of them. They next went to Tahiti, where Christian, after some of the party had landed, cut the cable, put to sea, and was no more heard of for many years, the *Bounty* having been eventually run ashore at Pitcairn island and burnt by Christian and his followers.

Captain Mayhew Folger touched at Pitcairn island in February 1808, to procure seals (supposing the island to be uninhabited, from the account given by Carteret), and then discovered it to be inhabited, and by some of the crew of the *Bounty* with their families. As proofs of his discovery, he obtained an azimuth compass and a timepiece which had belonged to that vessel, the former was sent to the Admiralty in 1813. Shortly afterwards, Vice-Admiral Dixon sent intelligence of their existence to Europe, H.M.S. *Briton*, Captain Sir Thomas Staines, having touched at the island on September 17th, 1814.

Subsequently, the island was frequently visited and described, and it was also proved that the *Bounty's* crew were not the first inhabitants, for several burial places were discovered containing skeletons, having a pearl shell (not found on the island) placed under the head; stone hatchets and other warlike implements were also among the remains.

The community having gradually become too numerous for the produce of the island to support them, it was necessary that some measure should be adopted for their relief. Norfolk island was therefore offered them as a gift, and accepted, and in June 1856 the whole of the descendants of the mutineers, numbering 192, were conveyed there in the transport *Morayshire*.

In December 1859, two families, numbering 16 people, returned to Pitcairn island in the brig *Mary Ann*, preferring the old to the new home. They found the island abounding in live stock, goats and fowls innumerable, sheep, and 52 head of cattle; the latter they unwisely destroyed.

In February 1864, 24 more people returned from Norfolk island; and in July 1884 the population numbered 130. In August 1889, the population numbered 125, comprising 58 males and 67 females, and in February 1896, when visited by H.M.S. *Wild Swan*, it amounted to 130. From 50 to 60 vessels besides missionary vessels now visit the island annually. The islanders appeared to be in fair condition and without any serious form of sickness, but from their more frequent contact with the outer world have lost much of their primitive simplicity of character.

Some years ago, they unanimously abandoned the ritual of the Church of England, and adopted the forms of a sect called "Seventh Day Adventists," by which the seventh day (Saturday) is kept holy, and there is no form of baptism.

Pitcairn island is about  $2\frac{1}{4}$  miles long East and West, and one mile wide; the entire circuit of the island, with one or two exceptions, is perpendicular. The highest part being about 1,000 feet above the level of the sea renders it visible 40 miles distant. The soil is very rich and fertile but porous; a great proportion is decomposed lava, the remainder, a rich black earth. The island is thickly clothed to the summit with luxuriant verdure, terminating in lofty cliffs, skirted at their bases with thickly branching evergreens.

The inhabitants state that there are no hidden dangers lying off the island, and that a vessel can with safety steam right round it beyond a quarter of a mile from the rocks.

**Adamstown** is situated on the north-eastern side of the island westward of Bounty bay, and, according to Captain Beechey, is in lat.  $25^{\circ} 3' 30''$  S., long.  $130^{\circ} 8' 30''$  W.

**Anchorage.**—The most convenient anchorage from which to communicate with the shore at Bounty bay, where the natives always prefer to land except in very bad weather, is in from 13 to 17 fathoms, sand, with rocky patches, about 5 cables from the shore, with St. Paul's point on with or just open eastward of Adams rock; and Young rock from West to W.  $\frac{1}{2}$  N.

This is an uncomfortable anchorage with easterly winds, in consequence of the ship's knocking about so much. The best anchorage with easterly winds of any strength is off the western end of the island about  $2\frac{1}{2}$  cables from the shore in about 12 fathoms, with Young rock bearing about N.E., and point Christian S. by E.

Sailing vessels almost invariably stand off and on, and the liability to sudden changes of wind renders it injudicious for them to anchor except when set towards the land in a calm.

**Landing.**—The precipitous coast of Pitcairn presents insurmountable obstacles to landing except at two places, viz., at Bounty bay, on the north-eastern side; and at a little cove on the western end of the island; the latter is a good one with winds from the eastward, but the ascent of the cliffs afterwards is a matter of considerable difficulty, and it takes at least an hour to reach the settlement by this route. Landing at Bounty bay in ship's boats is somewhat dangerous, and the islanders' boats are nearly always used; in any case, the services of an islander to pilot a boat in to the landing should be secured.

**Supplies.**—The surplus produce of the island, which in 1889 was considerable, allowed of fowls, bananas, sweet potatoes and other semi-tropical fruits and vegetables being sold in moderate quantities and at reasonable prices, but the greatly increased frequency of the visits of shipping must have reduced the power of supply to a minimum.

Water is at times scarce, there are no springs on the island; but generally there is an abundance of rain.

**Winds.**—There are no regular trade winds at Pitcairn island. In the summer months the wind prevails mostly from E.S.E. to North. Northerly winds are generally light, often accompanied by rain or fog; from North the wind invariably goes round to the westward, from which quarter and from S.E. are the strongest gales; when the wind is from the S.W. the weather is generally clear with moderate breezes. During the winter season, the prevailing winds are between S.W. and E.S.E.

**Current.**—There is generally a westerly current running past the island which is frequently of considerable strength.

**OENO ISLAND\*** is an atoll and was discovered by Captain Henderson of the *Hercules*, but was named after a whaler, the master of which had not seen it before; it lies 65 miles N.W. by N. from Pitcairn island, in lat.  $24^{\circ} 1' S.$ , long.  $130^{\circ} 41' W.$ ,† and is low and dangerous; coral reef completely surrounds the lagoon, near the centre of which is a small island covered with shrubs, and towards the northern extreme are two sandy islets a few feet above water. The lagoon is fordable on the western side as far as the wooded island, but in other places appeared to be 2 or 3 fathoms deep. Landing is extremely dangerous, even when practicable, and the island is uninhabited.

**Minerva or Ebrill reef**, upon which it was assumed that the ship *Sir George Grey* was lost, in 1865, was searched for by H.M.S. *Alert* in 1880, in the position assigned to it, viz., between the parallels  $22^{\circ} 32' S.$  and  $22^{\circ} 45' S.$ , and meridians  $133^{\circ} 20' W.$  and  $134^{\circ} W.$  No breakers being observed, nor shoal ground found, the reef was for a time expunged from the Admiralty charts; but in the year 1890, the German barque *Erato* having passed over a shoal in lat.  $22^{\circ} 44' S.$ , long.  $133^{\circ} 35' W.$ , it was considered to be identical with the Minerva reef, which was then replaced on the charts in this latter position and under the same name.

**PORTLAND BANK.**—In the year 1853, H.M.S. *Portland* sailed over this bank at mid-day, on a N.E. course, for  $4\frac{1}{2}$  miles, when the bottom was clearly seen, and soundings of 7, 13, and 15 fathoms

\* See chart, No. 783. Also plan of Oeno island on sheet of plans, No. 1,176.

† The captain of the German ship *Schiffbock* states (1899) that the correct longitude of this island is about  $130^{\circ} 56' W.$ , which longitude being contrary to previous authorities, is not accepted without further corroboration.—E. H. H.

were obtained. At the western end of the reef, Manga Reva was plainly visible from the deck, bearing N. 47° W., distant 44 miles.

The Master of the Chilian brig *Nautilus*, reported in 1887 having anchored in 15 fathoms, on, and examined the Portland bank. On the shoalest part he found a rocky reef, on which the sea broke heavily; this part appeared to consist of patches, with depths of from 4½ to 6 fathoms, no part being seen above water. The rest of the bank is apparently of sand, with from 15 to 17 fathoms. On April 2nd, 1893, the Chilian barque *Antonietta* also passed over the Portland bank; the captain considered it to be about 7 miles long and 2 or 3 miles wide, and in other respects corroborated the descriptions of the *Portland* and *Nautilus*.

The position assigned to the shoalest part of Portland bank is lat. 23° 41' S., long. 134° 30' W.

**TIMOE or CRESCENT ISLAND**, the south-easternmost island of the Tuamotu archipelago proper, was discovered by Captain Wilson, of the ship *Duff*, in 1797. The South extreme is in lat. 23° 20' S., long. 134° 29' W.; it is 3½ miles in length, 1½ miles wide, of similar formation to Oeno and Ducie islands, and without inhabitants. It consists of a strip of coral about 100 yards wide, about 2 feet above water, enclosing a lagoon into which there is no passage. Upon this strip of coral are several small islands (the highest being about 6 feet above the sea) covered with trees nearly 20 feet high. Landing appeared impossible on account of the heavy surf.

**MANGA REVA or GAMBIER ISLANDS\*** were discovered by Wilson, May 25th, 1797, and named by him Gambier islands after Admiral Lord Gambier. The group consists of a barrier coral reef, enclosing four small inhabited islands and numerous islets. They are of some importance to the navigator, inasmuch as they afford a somewhat indifferent supply of water as well as plenty of fish, a few fowls, goats, and considerable quantities of oranges, cocoanuts, and other tropical fruits.

**Population, &c.**—In 1879, these islands contained a population of about 1,000, but in 1894 the total inhabitants were only about 500, and of these at least 100 were not native born; at the same time it was said that 30 years previously the population had been 4,000. The French authorities attribute this wholesale deterioration to the generally low type of the people, who appear to have adopted all the bad habits of Europeans and none of their good ones; they are represented as being of poor physique, gentle, and honest, but idle, drunken, and dissolute. Their principal occupation is the mother-of-pearl fishery.

Roman Catholic Missions are established, and the few children there are attend the religious schools established at Rikitea, where also the

\* See Admiralty plan:—Manga Reva or Gambier islands, No. 1,112; scale, m = one inch.

Administrator and two gens d'armes, the only Government officials, are stationed.

The external form of the group conveys at once an impression of their volcanic origin, the Barrier reef, nearly 40 miles in circumference, contrasting conspicuously with the principal islands. On the north-eastern side of the Barrier reef there are many low detached islets covered with bush and a few cocoanut trees. On the opposite side, the Barrier reef dips from 5 to 7 fathoms below the surface, affording an entrance to the lagoon within, where in all directions live coral appears to be fast growing up. The outer side of the Barrier reef springs from a great depth, the inner side descends with a slope to very irregular depths of from 3 or 4 to 20 or 25 fathoms.

**Wind and Weather.**—There are two well-defined seasons at these islands; one from January to June of excessive heat, the other from July to December of lower temperature during which rains occur. The first three months of the year are the hottest, with long periods of calm. In the end of March, the S.E. trade commences to blow and gradually increases in strength until July and August—in the latter month gales sometimes supervening and changing through South and West to N.W. with rains. By the end of September the bad season is over, and the trade wind gradually decreases in strength until, towards the end of December, it dies away altogether. It is very rare that any other wind than the S.E. trade wind is experienced at these islands.

**Caution.**—The mariner is cautioned that the Admiralty plan of Manga Reva cannot be considered complete, and there are doubtless many coral heads in the lagoon not yet discovered; a careful look-out from aloft is therefore absolutely necessary.

**Manga Reva** or Peard island, the principal island of the group, is situated near the centre; and mount Duff, its highest peak, rises 1,315 feet above the sea level. The other high islands are Aka Maru or Wainwright island, Au Kena or Elson island, Tara Vai or Belcher island, Aga Kuitai, Makaroa or Marsh island, Kanaka or Collie island, Manui and Maka-pu.

Manga Reva island is about 4 miles in length, N.E. and S.W., and mount Duff, at its south-eastern point, rises into two peaks in the form of wedges, very conspicuous at a distance, and visible about 45 miles. All the islands are steep and rugged, particularly Makaroa, 480 feet high, which at a distance resembles a ship.

The village of Rikitea is on the eastern side of Manga Reva, and north-eastward of mount Duff. The flagstaff is in lat. 23° 7' 34" S., long. 134° 57' 45" W.

**Passages.—Depths.**—There are three passages into the lagoon; the South-east, South-west, and North-west passages, which, by attending to the following directions, may be used with safety by vessels up to 12 feet draught, the greatest draught that can safely proceed to the anchorage at Rikitea, which is the only well-sheltered anchorage amongst these islands.

**North-west passage.**—For entering by the North-west passage, between Manga Reva and Tara Vai islands, the leading mark is, the peak of Aka Maru island seen midway between those two islands bearing E.S.E. southerly, which leads over a depth of  $3\frac{1}{2}$  fathoms; and a vessel should anchor when mount Duff bears about N.E. Or, if bound to Rikitea, proceed on the leading line given until mount Duff bears N.N.E.  $\frac{1}{4}$  E. when a beacon on Au Kena will be seen in line with a belvedere on the S.W. point of that island, which, kept in line on an E. by N.  $\frac{1}{2}$  N. bearing, leads between some coral reefs but over the Banc Brisant, a patch of  $2\frac{1}{2}$  fathoms; therefore a vessel of 12 feet draught or upwards cannot follow this line, but keeping more to the southward, should leave this and other banks on the port hand, conning the ship from the masthead, until the beacon on the eastern side of Manga Reva is seen between the buoys in the channel leading into port Rikitea.

**South-east passage.**—This is the best passage by which to enter; it lies on the south-eastern side of the group, southward of all the coral islands, and with mount Duff bearing N.W.  $\frac{5}{8}$  N. in line with the S.W. point of Maka-pu island, off the southern end of Aka Maru; see view on chart No. 767. With these marks, steer over the Barrier reef, on which there is at this part 6 fathoms water, and thence in from  $5\frac{1}{2}$  to 10 fathoms to pass close to the southern extreme of Maka-pu island; then keeping a look-out at the masthead and a boat ahead in order to avoid the numerous reefs off the S.E. point of Manga Reva, some of which are beacons and buoyed, but such marks cannot be trusted to be in position; proceed at slow speed or under easy sail for the anchorage southward of mount Duff, or for the anchorage of Rikitea, if required, and if of not more than 12 feet draught.

**South-west passage.**—This is the best passage by which to quit the anchorage near mount Duff under sail with a good breeze. Bring the eastern bluffs of Manga Reva island in line N.N.E.  $\frac{1}{4}$  E. and then steer S.S.W.  $\frac{1}{4}$  W. keeping this mark on, which leads over the Barrier reef in 6 fathoms. Although this channel lies to leeward of the group, there is generally a very heavy swell on the Barrier reef, the sea often breaking on it in 4 fathoms; and it is not advisable to attempt the passage in light winds, for there being no anchorage ground outside, and no bottom at

---

See plan, No. 1,112.

80 fathoms within 40 yards of the breakers, the swell and current might drift a vessel on a shallow part of the reef on either side of the channel, which would mean instant destruction.

**Anchorage.—Water.**—The anchorage under mount Duff is the most convenient for watering. Here a ship will be abreast of two streams of good water, but there is some difficulty in procuring it, on account of the coral ledges which surround the island. The best water may be had on the southern side of Au Kena, where there is no surf, but the mount Duff anchorage appears to be on the whole the most convenient.

Lieut. Joulia of the French navy recommends as a fair temporary anchorage for large vessels, well sheltered from south-easterly wind and sea, the space just inside the outer bar of the North-west passage, under cover of Tara Vai, in 7 or 8 fathoms. There are many other anchorages to which the pearl schooners from Tahiti resort, but in the present imperfectly surveyed condition of the group it is impossible even to indicate them.

**Pilotage.**—Many natives can be found with a very good knowledge of the position of reefs, &c., but none with sufficient capacity or nerve to be entrusted with the pilotage of even the smallest vessel.

**Port Rikitea.**—Opposite the south-eastern point of Manga Reva is a channel about one cable wide, between the fringing reef and the end of a long narrow reef projecting from the western end of Au Kena. The extremes of both reefs are marked by buoys, and a beacon stands on the middle of the eastern side of Manga Reva as a mark to steer for. This channel leads into the outer port of Rikitea, which is large enough to accommodate a number of vessels. From the fringing reef, which forms the western side of the outer port, the depth increases to 25 fathoms and then shoals towards the coral heads and banks which form the eastern side. The bottom is mud and coral, and the depth rather great for anchoring; the holding-ground also is not always good, depending on the even surface or otherwise of the bottom, the depths being very irregular, and the anchorage unsuited for vessels drawing over 12 feet. Slack water should be chosen for entering, as at certain times of tide the current is strong and variable, and the width, in places, is not more than about 50 yards.

The inner port of Rikitea is perfectly secure, but can only be entered by *short* vessels up to 12 feet draught. The channel through the reefs from the outer port is closely buoyed and beacons, but most difficult, and not to be attempted without accurate knowledge; the space within, close to the shore, is very confined.

**Tides.**—It is high water, full and change, at 2 h. 30 m.; springs rise 4 feet.

---

See plan, No. 1,112.



**MORANE**, or Cadmus island, about 115 miles W.  $\frac{3}{4}$  S. from Manga Reva, is a low coral atoll, 5 miles long by  $2\frac{1}{2}$  miles broad, without any entrance to the lagoon, in which are three low islands inhabited by about a dozen natives, who cultivate a few cocoanut trees. Position of centre according to the French despatch vessel *Mégère*, lat.  $23^{\circ} 8' S.$ , long.  $137^{\circ} 8' W.$

**MOERENHOUT**, or Maria island, lies 94 miles N.W.  $\frac{3}{4}$  W. from Manga Reva in lat.  $22^{\circ} 0' S.$ , long.  $136^{\circ} 12' W.$  It was discovered by Mr. Thomas Ebrill, in the ship *Amphitrite*, in 1832, and is low and wooded, having a lagoon in the centre, without any pass through the reef. It has a few inhabitants, and the northern and southern extremes are planted with cocoanut trees.

**MARUTEA**, or Lord Hood island, was discovered in 1791, by Captain Edwards of H.M.S. *Pandora*. It is a cluster of small islets rising from a chain of coral, even with or a little above the water level. On these islets grow a variety of shrubs and trees. The atoll is 11 miles long and  $4\frac{3}{4}$  miles wide, in a North and South direction, and encloses a lagoon into which there is no entrance. It is not inhabited but is frequently visited by the natives of Manga Reva for pearl shell, which is abundant. The western point is in lat.  $21^{\circ} 31' S.$ , long.  $135^{\circ} 38' W.$

**ACTÆON GROUP**.—The nearest island of this group is about 40 miles westward of Marutea. The group consists of four islands, and was discovered by Ebrill in 1833.

**Maturei Vavao**, or Melbourne island, the south-eastern-most and largest, is about 6 miles long N.W. and S.E., and wooded except on the western side. Pearl fishermen have several times attempted to establish themselves here but have been compelled to abandon the place, the sea washing all over it in bad weather. There is no pass into the lagoon.

The N.W. extreme is in lat.  $21^{\circ} 25' S.$ , long.  $136^{\circ} 25' W.$

**Tenarunga**, or Minto island, another atoll in lat.  $21^{\circ} 18' S.$ , long.  $136^{\circ} 31' W.$ , lies about 8 miles north-westward of Maturei Vavao; it is much smaller than the latter, and, like it, is very low but wooded, and without a pass through to the lagoon; it is without permanent inhabitants.

**Vahanga**, or Bedford island, lies about 5 miles westward of Tenarunga, is about 2 miles in extent in each direction, without any pass into the lagoon, wooded, and uninhabited.

**Tenararo island**, the smallest of the group, is in lat.  $21^{\circ} 18' S.$ , long.  $136^{\circ} 45' W.$ , and lies 5 or 6 miles westward of Vahanga; it also is wooded, has no pass into the lagoon, and is not inhabited.

**Current.**—The current in the neighbourhood of these islands, with a light westerly wind, was found to set E.N.E. 7 miles in twenty-four hours; but the direction varies with the wind, and it usually sets westward.

**FANGATAUFA**, or Cockburn island, was discovered by Beechey in 1826. It is a small atoll  $3\frac{1}{4}$  miles in length by 3 miles in width. Its form is nearly oblong, with the southern side much curved. The lagoon is deep, the boundary reef very low, narrow, and in places the sea overflows, but there is no pass into the lagoon. It is uninhabited.

The hillock at the N.E. end is in lat.  $22^{\circ} 12' S.$ , long.  $135^{\circ} 42' W.$

**MURUROA**,\* or Osnaburg island, about 20 miles N.N.W. of Fangataufa, was discovered by Carteret in 1767. In 1792, the *Matilda*, a whaler, was wrecked on a reef, reported as in lat.  $22^{\circ} 0' S.$ , long.  $138^{\circ} 34' W.$  In February 1826, Beechey, when exploring the vicinity, determined the identity of the spot by finding on the reef of Mururoa unequivocal signs of a shipwreck; two anchors, a cannon, a metal boiler, and leaden pump, marked 1790, and there can be but little doubt that these were the remains of the *Matilda*.

According to a survey by French officers in 1881, Mururoa is an atoll about 15 miles long E.N.E. and W.S.W. by 8 miles wide; on the reef enclosing the lagoon is a chain of 18 islands with generally but very narrow openings between them except on the north-western side. Most of the islands are wooded, especially the more eastern ones, and large plantations of cocoanut trees have been made by a company to whom the islands were assigned in 1876. There are no outlying dangers, and the greatest extension of the reef from the islands is about 2 cables on the eastern side and one cable on the western side. It is reported that the soil of the islands is fast being washed away.

The village is on the western or inner side of the eastern island, and the observation spot, near the western side of the entrance to the lagoon, is in lat.  $21^{\circ} 50' S.$ , long.  $138^{\circ} 56\frac{1}{2}' W.$

**Passes.**—There are two passes into the lagoon, both on the north-western side; they are on either side of a low barren islet, the reef bordering the other side of each pass being awash. From the islet, reef extends about 2 cables eastward, but only about 100 yards westward. The eastern pass is considered the widest and best; both are very short and have about 12 feet water, but before attempting either, a stranger should examine them from a boat.

The heavy surf on the shore forces the sea over the reef into the lagoon at many places, except at low water, and occasions a constant but not very

---

\* See chart No. 767. Also plan:—Mururoa; scale,  $m = 0.43$  of an inch, on No. 1,175.

strong outset through the channel to leeward. The lagoon must be navigated by the eye from aloft, as, although there are general depths of 20 fathoms, it is dotted with knolls of coral, in some cases so close to the surface as to be dangerous even to boats sailing with a fresh breeze, especially in cloudy weather, when they are difficult to distinguish.

**Anchorage.**—The holding-ground inside the lagoon is not good, and north-westerly winds throw in a troublesome sea.

**TEMATANGI** or Bligh island, 90 miles westward of Mururoa, was discovered by Bligh in 1792, and named by him Lagoon island. The atoll is about 7 miles in diameter. The natives seen by Beechey were armed with clubs and spears; some of them were removed to Tahiti in 1858, being strongly suspected of having eaten the shipwrecked crew of the *Sarah Anne*; those now inhabiting the island are friendly.

The eastern side of the atoll for about 6 miles is wooded without a break; the north-western side also for 4 or 5 miles, but here the trees are more in groves or clumps. Off the N.W. point are some large blocks of coral over which the sea breaks furiously. There is no pass into the lagoon, but, with easterly winds, landing is fairly easy and safe on the western side at a sort of natural causeway connecting two wooded islands.

The North point of the island is in lat.  $21^{\circ} 38' S.$ , long.  $140^{\circ} 40' W.$

**TUREIA**, also known as Papakena or Carysfort island, 60 miles N. by E. of Mururoa, was discovered by Captain Edwards, H.M.S. *Pandora*, in 1791. The atoll is about 5 miles in diameter, very low, well wooded except on the south-eastern side, and has no pass into the enclosed lagoon. There are less than 20 inhabitants.

The East extreme is in lat.  $20^{\circ} 45' S.$ , long.  $138^{\circ} 30' W.$

**VANA VANA**, also known as Kurateke or Barrow island, 32 miles W.  $\frac{1}{2}$  S. of Tureia, was discovered by Beechey in 1826. The atoll consists of a narrow strip of land about 200 yards wide surrounding a lagoon  $1\frac{1}{4}$  miles in length North and South, and about  $1\frac{1}{4}$  miles wide, into which there is no pass, and in which the colour of the water indicates no great depth.

On the shore of the lagoon, the pandanus, cocoanut trees, and bushes constitute a thick wood. Under the trees three large pits were found containing fresh water. No natives were seen on the island by Beechey, but some canoes were found on the lagoon. In 1861 there were a few inhabitants, and it is still reported to be inhabited.

The North end of Vana Vana is in lat.  $20^{\circ} 45' S.$ , long.  $139^{\circ} 10' W.$

**DUKE of GLOUCESTER ISLANDS** consist of a small group of three atolls, which were so named by Carteret in 1767.

**Nukutipipi** or Margaret island, the easternmost of the group, is a small round lagoon island about 2 miles in circumference, high and well wooded on the northern side, with a flat submerged reef on the eastern side, but no pass.

The south-western point is in lat.  $20^{\circ} 42' S.$ , long.  $143^{\circ} 5' W.$

**Anu Anurunga**, in lat.  $20^{\circ} 38' S.$ , long.  $143^{\circ} 19' W.$ , also known as Coronados or Four Crowns, from the four islands on the atoll, lies 13 miles W. by N. of Nukutipipi, and was discovered by Quiros in 1606. There are five clumps of trees on the islands, but no entrance to the lagoon; landing is impossible, and there are no inhabitants.

**Anu Anuraro**, 14 miles W.N.W. of Anu Anurunga, was named Archangel island by Quiros in 1606; its true position and character were determined by the U.S. Exploring Expedition in 1841.

It is a small atoll of oblong shape, lying N.W. and S.E., wooded on the eastern side only with stunted trees in clumps. A reef extends off the N.W. and S.W. sides, on which there is a heavy surf, and there is a submerged reef on the South and West sides; on the western side, soundings of 15 to 20 fathoms extend at one part for about 2 cables from the reef, and here, with easterly winds, a vessel might temporarily anchor.

There is one small boat entrance to the lagoon on the north-western side, and landing may be effected in this part in fine weather without danger.

The centre is in lat.  $20^{\circ} 29' S.$ , long.  $143^{\circ} 33' W.$

**HEREHERETUE** or San Pablo was discovered by Quiros in 1606, and was examined by the officers of the U.S. exploring vessel *Porpoise*, in 1841. The atoll is thickly wooded and encloses a lagoon about 3 miles in diameter with no entrance. Landing is fairly easy on the north-western side during south-easterly winds, but with other winds it is very difficult anywhere. There are cocoanut trees, plenty of fowls and fish, but no pearl shell. The village, containing a dozen or so of inhabitants, is behind a grove of trees near the western point; the natives seldom venture outside the reef in their canoes.

The North end is in lat.  $19^{\circ} 52' S.$ , long.  $145^{\circ} 0' W.$

**REAO** or Clermont-Tonnerre island, of which the eastern end is in lat.  $18^{\circ} 34' S.$ , long.  $136^{\circ} 20' W.$ , was discovered by Captain Duperré, in *La Coquille*, in 1822. The atoll is 10 or 11 miles long, W.N.W. and E.S.E., and very narrow, particularly at the extremes, and when seen at a distance, end on, does not appear more than half a mile wide. With

the exception of a few breaks on the southern shore, the land is almost continuous and covered with bush. At the extremes and angles the soil is higher than in other parts and has both shrubs and cocoanut trees, which can be seen from a ship 15 or 16 miles distant.

The enclosed lagoon is without any entrance, and contains several small islets; the shores all round are steep. It is inhabited, the village, where is the best landing, being at the N.W. point; the houses stand in a row along the shore and conspicuous amongst them is a stone church with a red roof. The people, about 150 in number, profess Roman Catholicism.

**PUKARUHA** or Serle island, 80 miles W.  $\frac{1}{2}$  N. from Reao, was discovered by Captain Wilson in 1797, during the missionary voyage of the *Duff*. The atoll is of coral formation,  $7\frac{1}{2}$  miles in length, N.W. and S.E., and  $2\frac{1}{4}$  miles wide near the south-eastern end but narrower at the other end, and wooded on the north-eastern side only. The south-western side differs from the rest in having a low barren flat, extending fully  $1\frac{1}{2}$  cables seaward beyond any vegetation, especially towards the southern part; on this account it is necessary to be cautious when approaching at night, as the land is so low that the breakers would be the first warning of danger.

The lagoon is very narrow and apparently shallow, with no entrance to it, and with several islands in the middle; there are about 20 inhabitants.

The S.E. extreme is in lat.  $18^{\circ} 22' S.$ , long.  $136^{\circ} 58' W.$

**TATAKOTO** or Clerke island, 90 miles N.W. by W. of Pukaruha, was discovered by Bonecheo in 1774. The atoll is 4 miles in length E.N.E. and W.S.W., and one mile broad; the land is very low and encloses a lagoon, into which there is no entrance. The north-western part is wooded; here there is a small village and cocoanut trees are abundant; there is also a little brushwood at the south-eastern part, but the southern part is merely reef.

A spot on the northern side about one mile westward of the N.E. extreme is in lat.  $17^{\circ} 18' S.$ , long.  $138^{\circ} 19' W.$

**PINAKI** or Whitsunday island, was discovered by Wallis in 1767. The atoll is  $1\frac{1}{2}$  miles in diameter, steep to all round, of coral formation, and encloses a lagoon. On the north-western side of the atoll are three large well-wooded islets, and the principal village is on the northern islet. The general height of the soil is 6 feet above the sea; from the trees to the surf there is a space of hard rock nearly 150 yards wide, covered with about one foot of water, beyond which the reef descends rapidly, and at 500 yards distance from it no bottom was found with 250

fathoms of line. The south-eastern side is very dangerous at night, the reef being bare of vegetation and but little above water.

The trees are similar to those at Reao, consisting principally of pandanus and cocoanut. From them to the lagoon is a gentle declivity of muddy sand.

On the southern side, there is a very narrow entrance to the lagoon, too shallow for the passage of boats even with a smooth sea.

The N.W. extreme is in lat.  $19^{\circ} 24' S.$ , long.  $138^{\circ} 43' W.$

**NUKUTAVAKE** or Queen Charlotte island, 8 miles N.W. of Pinaki, was discovered by Wallis in 1767; it is about 5 miles long N.E. by E. and S.W. by W., wooded except at its eastern end, is of coral formation, but has no lagoon. It has about 20 native inhabitants.

The East extreme is in lat.  $19^{\circ} 17' S.$ , long.  $138^{\circ} 49' W.$

**VAIRAATEA** or Egmont island, 22 miles W. by S. of Nukutavake, was discovered by Wallis in 1767; it consists of two islands on the same reef, the eastern one being named Puka Runga and the western Puka Raro, *runga* signifying windward and *raro* leeward.

The islands are well wooded with cocoanut and pandanus trees. Landing is very difficult and dangerous on account of the heavy swell. There are about 30 inhabitants on the two islands.

The North extreme is in lat.  $19^{\circ} 18' S.$ , long.  $139^{\circ} 18' W.$

**VAHITAH**i or Cook Lagoon island, 33 miles N. by W. of Nukutavake, was discovered by Bougainville in 1768, and was seen and described by Cook in 1769, on his first voyage in these seas. The atoll is 3 miles in length W. by S. and E. by N. and about one mile wide; the southern side is a low reef.

There are large clumps of cocoanut and other trees on the western part, but the eastern end is not wooded. The enclosed lagoon has no pass into it, is in some parts very shallow and contracted, and contains many islets. The shore is steep-to except on the southern side, which should not be approached within  $2\frac{1}{2}$  cables.

In 1826, Beechey spoke highly of the natives for integrity and good nature; they now number about 30.

The North extreme is in lat.  $18^{\circ} 42' S.$ , long.  $138^{\circ} 50' W.$

**AKIAKI** or Thrum Cap island, 23 miles W.N.W. of Vahitahi, in lat.  $18^{\circ} 30' S.$ , long.  $139^{\circ} 14' W.$ , was discovered by Bougainville in 1768 and called by him Des Lanciers. It is of coral formation, three quarters of a mile in diameter, has no cocoanut trees, but is otherwise well wooded except on the eastern side, and is steep-to all round. At one mile distant no bottom was found with 400 fathoms of line. The island is higher than

any others of the Tuamotu group and has no lagoon. Landing is very difficult, and there are reported to be about 20 native inhabitants.

**AHUNUI** or Byam Martin island was discovered by Beechey, in 1826, and named after the Controller of the Navy. The 'atoll is of oval form, about  $3\frac{3}{4}$  miles in diameter, of coral formation, and has a lagoon into which there is no pass.

Beechey procured a supply of firewood here, which burnt a long time, gave great heat, and was as hard as *lignum vitæ*. He found no inhabitant, and it is still reported to be without population.

The North end is in lat.  $19^{\circ} 37' S.$ , long.  $140^{\circ} 25' W.$

**PARAOA** or Gloucester island, in lat.  $19^{\circ} 8' S.$ , long.  $140^{\circ} 40' W.$ , was discovered by Wallis in 1767; it lies 32 miles N.W. by N. of Ahunui. It is wooded, without any pass into its lagoon, and without inhabitants. Beechey visited it in 1826 and observed at the south-eastern point of the island a morai or burying place built of stones, but no inhabitants. The *Blossom* had a narrow escape here; Captain Beechey says, "In passing to windward of the island, the current unexpectedly set so strong upon it that the ship was for some time in imminent danger of being thrown on the rocks, and the escape is entirely attributable to the rapid descent of the coral reef, which at times was almost under the bottom."

**MANUHANGI** or Cumberland island, 30 miles W. by S. of Paraoa, in lat.  $19^{\circ} 12' S.$ , long.  $141^{\circ} 16' W.$ , was discovered by Wallis in 1767, who described it as being 6 miles long and  $1\frac{1}{4}$  miles broad. It is wooded except on the south-western side, but is without a pass and uninhabited.

**NENGONENGO** or Prince William Henry island was discovered by Wallis in 1765. The atoll is about 6 miles wide and nearly circular. The southern part is bare reef on the south-eastern and western sides, with a cocoanut grove on the southern end. The southern side of the northern part is bare reef with some high clumps of trees on the eastern side.

There is a good passage into the lagoon on the eastern side about 4 miles northward of the South point of the atoll. This entrance is about 100 yards wide, and is said to have a depth of 6 fathoms.

The anchorage is good on either side of the pass, and the lagoon is reported to abound in pearl shell and pearl oysters, in which black pearls are found. Landing is fairly easy on the lee side of the atoll, but there are no inhabitants.

The East point of the island is in lat.  $18^{\circ} 46' S.$ , long.  $141^{\circ} 45' W.$

**HAO**,\* also known as Harpe or Bow island, was discovered by Bougainville in 1768 and was visited by Cook the following year, who gave the atoll the latter name from its supposed resemblance to a bow. Its figure on paper, however, is very irregular, and bears but small resemblance to the weapon after which it was named. It is of coral formation, 30 miles long, and has an average width of 5 miles, and an extreme width of 9 miles. The reef has on it a number of little islands on most of which there is brushwood, especially on the weather side, but very little on the other, and so low is the reef in this latter half that the sea in places washes into the lagoon. There are several groves of cocoanut trees in the eastern and northern part.

The only pass into the lagoon is about the middle of the northern end, and by this H.M.S. *Blossom* entered, but, though practicable for vessels of 15 feet draught, it is sometimes dangerous for boats in consequence of the overfalls, especially a short time after high water. The pass is easily recognised when coming from the northward by the wide break in the reef and by two fine cocoanut groves and several houses. There is good landing for boats inside the western entrance point.

The best time to enter is at high water slack, as the velocity of the ebb often prevents a ship from steering. It is at all times a difficult place to enter with a vessel drawing over 15 feet, and cannot be entered against the ebb in a sailing vessel without a breeze which would command a speed of at least 6 knots, as the current runs above 4 knots.

Approaching the entrance from seaward, the state of the current can generally be pretty fairly estimated by the "tail race" which sweeps to sea for about three quarters of a mile; directly this slackens or ceases the entrance may be approached; it is, however, very narrow, and is further contracted by two coral knolls in the centre, covered by only 16 feet water, and by the reefs extending far into the channel from both sides, especially from the eastern side; so that although the reefs above water are a cable apart, the inner part of the navigable channel is only 80 or 90 feet wide. The trade wind also does not always allow a ship to lie well through.

**Anchorage.**—The lagoon is full of coral heads and a vessel has to be navigated by the eye from aloft. The *Blossom* anchored in the north-eastern part of the lagoon in 10 fathoms, on a broad patch of sand, about  $2\frac{1}{2}$  cables from the shore. The usual anchorage now is off the village, about 6 miles E.S.E. from the pass; the position is indicated by the village church.

The inhabitants are friendly and obliging, they numbered about 400 in 1894.

---

\* See chart, No. 767. Also plan of Hao island, No. 1,111; scale,  $m = 0.5$  of an inch.



The morai on the eastern side of the entrance is in lat.  $18^{\circ} 3' 38''$  S., long.  $140^{\circ} 59' 15''$  W.

**Supplies** consisting of fish and a few fowls and pigs are obtainable, and water of inferior quality may be obtained by digging wells. The pearl oyster is found in the lagoon.

**Tides.**—It is high water, full and change, at 2 h. 40 m.; springs rise  $3\frac{1}{2}$  feet.

**AMANU** or Moller island, which lies north-eastward of the northern end of Hao island and is separated from it by a channel 9 miles wide, was discovered by Bellingshausen in 1829. The atoll is 18 miles long N.E. and S.W. and 8 or 9 miles wide. The north-western and south-eastern sides are not wooded. At the north-eastern end are some fine groves of cocoanut trees, and at the south-western end are pandanus and cocoanut trees.

There is a boat entrance through the reef some miles westward of the North extreme of the atoll, but the principal pass, available for schooners, is well down towards the southern end on the western side where the southern wooded part ceases. The pass is free from dangers and the stream is not strong, but the wind requires to be well northward of East for a vessel to lie through it. When in the lagoon careful steering is required to avoid the coral heads. The anchorage is about  $1\frac{1}{2}$  cables eastward of the village.

The village is on the southern side of the principal pass; it contains about 60 or 70 inhabitants. The natives are friendly, and pearl oysters are said to be abundant.

**Tides.**—Outside the pass, the tide runs to the northward on the flood, and to the southward on the ebb.

The North point of Amanu is in lat.  $17^{\circ} 40'$  S., long.  $140^{\circ} 39'$  W.

**MAROKAU and RAVAHERE** or Dawahaidi were discovered by Cook in 1773, and by him called the Two groups. They are very low, and each encloses a lagoon. They are separated by a narrow channel, in which, however, there is room for the largest ship to work, but the current running strongly through it frequently causes heavy overfalls dangerous to small sailing vessels.

**Ravahere** is about 10 miles long N.N.W. and S.S.E. and not half that width. On the eastern side, several parts of the reef are sufficiently high to sustain clumps of brushwood of some little height, but on the western side the reef, where above water, is quite bare. There is no pass

into the lagoon and no inhabitants. The south-eastern point affords the best landing but under the best conditions it is always dangerous.

The South extreme of Ravahere is in lat.  $18^{\circ} 18' S.$ , long.  $142^{\circ} 12' W.$

**Marokau** is wooded for its whole length, nearly 10 miles, along the northern side, and there are two islands on the eastern side of the reef near the southern end between which is a pass into the lagoon available in fine weather for small craft. But the best place for communication is on the northern side, near the N.E. point of the atoll, where stands a well-built village of about 120 inhabitants; here is a cutting through the reef protected by a pier of rough stones which affords a fairly protected landing place for boats in all easterly or southerly winds, but with the wind from the northward it is not to be approached.

A vessel hove-to off this landing must be cautious as the current has been found to set towards the reef.

**REITORU** or Bird island was discovered by Cook in 1769. It is small, low, covered with brushwood on its northern side, encloses a lagoon, and is resorted to by birds in large numbers for incubation. There are no inhabitants and there is no pass into the lagoon, but it is reported that pearl shell has been found here.

The North point is in lat.  $17^{\circ} 48' S.$ , long.  $143^{\circ} 7' W.$

**HARAIKI**, also called St. Quentin or Croker island, 32 miles N.W. by W. of Reitoru, was discovered by Bonecheo in 1772. The atoll is about 4 miles long N.W. and S.E., is rather higher than usual and well wooded on its northern side; it has a small but good entrance to the lagoon on its south-western side, fit for small craft; and good anchorage amongst coral patches, when inside, northward of the pass. The island is uninhabited.

The North point is in lat.  $17^{\circ} 29' S.$ , long.  $143^{\circ} 31' W.$

**HIKUERU** or Melville island was discovered by Cook on the 6th April 1769, and called by him Bird island. The atoll is about 7 miles long East and West, well wooded, except on the eastern and south-eastern sides which are bare, and encloses a lagoon extremely rich in pearl shell. A flourishing village has recently been erected on the south-western side of the atoll, and it has been made the official residence of the administrator of a district.

Landing is effected in a break in the reef in front of the village, but it is always difficult, and with northerly winds impossible.

The North-west end is in lat.  $17^{\circ} 35' S.$ , long.  $142^{\circ} 41' W.$

**TEKOKOTO** or Doubtful island, in lat.  $17^{\circ} 20' S.$ , long.  $142^{\circ} 37' W.$ , and 16 miles North of Hikueru, was discovered by Cook on 11th August

1773; it is a circular reef one mile in diameter, well wooded with cocoanut trees, and consequently visible at a considerable distance. On the western side, where the trees are highest, landing may be effected in a break in the rocks. Great numbers of birds resort to this island.

**TAUERI**, also known as Resolution or St. Simon island, was discovered by Bonecheo in 1772 and named Resolution by Cook in 1773 after his ship. The atoll is about  $4\frac{1}{2}$  miles in diameter and comprises two small islets, on which are many cocoanut trees, but the greater portion of the southern and western sides are bare reef.

There are several canoe passages into the enclosed lagoon on the north-western side, difficult of access at low water; the inhabitants are few and friendly. No pearl shell is found here. The South point is in lat.  $17^{\circ} 23' S.$ , long.  $141^{\circ} 30' W.$

**REKAREKA** or Good Hope island lies 38 miles N.W. of Taueri. The atoll is about 4 or 5 miles in circumference. There is a boat entrance to the lagoon on the north-eastern side. The island is well wooded but least so on its southern side, and inhabited by a few friendly natives, whose small village is at the S.W. point, where is also the best landing.

The South end is in lat.  $16^{\circ} 51' S.$ , long.  $141^{\circ} 55' W.$

**MARUTEA** or Furneaux islands is an atoll discovered by Cook in 1773, and is one of the most dangerous in the archipelago; it is about 20 miles long W.N.W. and E.S.E. and has an extreme width of about 10 miles. On the south-western side, the encircling reef is completely submerged, and on the north-eastern side there are only a few places where the reef is sufficiently above water to support a few small clumps of trees.

At the north-eastern extreme, there is a pass into the lagoon practicable for small craft but difficult both for ingress and egress; the place is marked by a single islet thickly wooded; the stream is always running out through this pass.

The best place for landing is in front of the last island on the N.W. side of the atoll where there are a few huts, but no permanent inhabitants.

The West point of Marutea is in lat.  $16^{\circ} 54' S.$ , long.  $143^{\circ} 20' W.$

**NIHIRU** or Nigeri atoll, the northern point of which is in lat.  $16^{\circ} 41' S.$ , long.  $142^{\circ} 53' W.$ , is nearly circular, about 7 miles in diameter, well wooded at its northern extreme, fairly so along its north-eastern side and at its south-eastern point, but between the South and S.E. points, there are only a few scrubby bushes. The reef extends a considerable distance from the South and south-eastern points, but forms a deep bight just westward of the latter.

There is no pass into the lagoon and no permanent inhabitants. The best landing place on the reef is in a large bay formed on the western side of the atoll.

A strong north-easterly current was experienced round the south-eastern point by the French war vessel *Mésange*, in 1874.

**FAKAINA** or Predpriatie (*Enterprise*) atoll was discovered by Kotzebue, in 1824. It is 4 miles in extent E.N.E. and W.S.W., well wooded with palm trees, encloses a lagoon, and is seen farther than most of these islands.

It has about 150 inhabitants, all Roman Catholics and entirely under the authority and government of the missionaries. The village is neatly built and kept, and stands on the north-eastern side of the island.

There is no pass into the lagoon and landing is not practicable at the village. The best and indeed the only safe landing is on the south-western side at a place marked by three houses and a flagstaff: from thence, those landing cross over the lagoon in boats to the village. Schooners embark cargoes of copra at this landing place.

**Water** is better at this than at most of the islands, but from the nature of the shore it is very difficult to obtain for ship use.

The centre of Fakaina is in lat.  $15^{\circ} 59' S.$ , long.  $140^{\circ} 8' W.$

**ANGATAU** or Araktchev atoll, 39 miles W. by N. of Fakaina, was discovered by Bellingshausen in 1820. It is wooded throughout, and in some places by trees of large growth, but there are very few coconut trees. There is no pass into the lagoon; landing is effected near the western point, where the village, containing about 120 inhabitants, stands; it is, however, difficult and dangerous, though the natives are always ready to lend a hand; with the wind northward of East, landing is easier on the South coast.

There are Roman Catholic Missionaries, a church, and a school on this island, but the people have as yet made but little progress from the savage state.

The centre is in lat.  $15^{\circ} 51' S.$ , long.  $140^{\circ} 50' W.$

**PUKA PUKA**, also called Honden or Dog island, was discovered by Le Maire and Schouten in 1616; it lies in lat.  $14^{\circ} 50' S.$ , long.  $138^{\circ} 50' W.$  It is an atoll enclosing a lagoon which communicates with the sea at very high tides only, by means of two channels, which are never navigable passes, on opposite sides of the island.

The soil is deeper on this island than on most of them and a variety of walnut tree is found, but there are no coconut trees, and no inhabitants.

**NAPUKA and TETOPOTO ISLANDS.**—These islands were discovered by Byron on 7th June 1765, and by him named the Disappointment islands. They are 100 miles distant from any other islands of the archipelago.

**Napuka** is a series of islets connected by coral reef of irregular form, enclosing a lagoon without any entrance pass to it; within the lagoon are many knolls about 4 or 5 feet above water.

The eastern and western sides are well wooded, the vegetation differing considerably from other islands of the archipelago; there are, however, a few cocoanut, bread fruit, and pandanus trees, but the southern side is almost entirely devoid of vegetation. There is a landing place about one mile from the western point, in front of the village, a mere collection of huts hidden behind the trees, but a flagstaff and the canoes on the shore may be seen; if there is any swell, landing is only possible in the native canoes.

This island is the most isolated and probably the most backward of the whole archipelago. The inhabitants, about 50 in number and nominally Catholics, are apparently of a distinct and inferior race, and but little removed from perfect savagery; they live on the fruit of the pandanus and on other naturally grown vegetable matter, and go entirely naked.

The N.W. point of Napuka is in lat.  $14^{\circ} 9' S.$ , long.  $141^{\circ} 14' W.$

**Tetopoto** is about 12 miles W.N.W. of Napuka, from which it is visible. The island is thickly wooded with large trees and is about one square mile in extent, having no lagoon, and, though a few natives have been found on it, probably is not permanently inhabited. Many turtle are seen in this vicinity.

**TAKUME** or Wolkonski atoll, discovered by Bellingshausen in 1820, is about 14 miles long. N.N.E. and S.S.W., but only about 4 miles wide; it encloses a lagoon into which there is no pass, though about 3 miles from the North point, on the north-western side, there is a break in the reef which looks like one, but it can only be used by small boats, and is the best landing place. The northern end is thickly wooded with cocoanuts, and it is very generally wooded all round, except on the south-eastern side where the islets only are wooded, the atoll being in that quarter partly submerged.

There is a large village at the northern point in lat.  $15^{\circ} 44' S.$ , long.  $142^{\circ} 9' W.$ ; it is only possible to land on the reef near the village with winds between South and West. The current runs sharply past this point and causes a heavy sea.

**RAROA** or Barclay island is an atoll discovered by Bellingshausen in 1820, it is about 21 miles long. N.N.E. and S.S.W., and has an extreme width of about 8 miles; it is lightly wooded on the eastern side, but the northern and western sides are covered with vegetation, especially about one mile southward of the West pass; but at the south-western point, where clumps of cocoanut trees formerly stood, there is now only brushwood and pandanus trees.

The village is on the western side of the atoll, half a mile south-westward of the pass, where a church and a large house are conspicuous from the offing. The village has about 100 inhabitants, some Catholics and some Mormons. A jetty, at first perpendicular to the shore and then parallel with it, in front of the village, gives access and good shelter, with the usual easterly winds, to a few small schooners and boats.

There is a small opening to the lagoon at the northern end, but the principal pass is on the West side and can be used by large vessels, but it has numerous patches of coral, and the tide runs out sometimes at from 6 to 8 knots. Captain Lejeune of the *Cassini* observes that there is good anchorage inside about one mile S.S.W. of the entrance and near the village among the cocoanut trees, but a pilot is necessary for any stranger entering the lagoon.

**Supplies.**—Pigs, fowls, fish, and water can be obtained.

The South point of Raroia is in lat.  $16^{\circ} 13' S.$ , long.  $142^{\circ} 31' W.$

**Current.**—A strong current usually runs to the westward between Takume and Raroia, and with the wind between N.E. and S.E. there is a heavy sea in this channel.

**TAENGA**, also known as Holt or Yermalov island, is a very low atoll, about 11 miles long East and West and 6 miles wide in the middle; it encloses a lagoon with which there is communication by two passes, a small one on the north-eastern side; the other, about  $1\frac{1}{2}$  miles from the South point on the south-western side, admits vessels of 200 tons, and is about 40 yards wide and 550 yards long, before it opens out into the lagoon, where it is divided into two channels by a small coral head, which dries at low water. As the pass lies S.W. and N.E. the wind is often too scant to sail in, and in such a case a vessel is often tracked in by the natives. A pilot should always be obtained.

The northern side of the atoll is well wooded; a great part of the southern side is awash and there are only two small clumps of cocoanut trees, one on either side of the pass. The village is a poor collection of huts on the southern side of the pass, and the inhabitants, about 100 in number, are by no means a fixed population.

The pass is in lat.  $16^{\circ} 20' S.$ , long.  $143^{\circ} 11' W.$

---

See Chart No. 767.

**MAKEMO\*** or Philip island has a total population of about 220, most of whom are excellent divers; it was discovered by the ship *Margaret* in 1803. The atoll lies W.N.W. and E.S.E., is about 40 miles in length, 8 to 10 miles wide, very low, and encloses a lagoon. The whole of the north-eastern side is well wooded, the southern side is generally about the water level and bare.

**Passes.**—There are two entrances to the lagoon, one on the north-eastern side, named the Pucheva pass, about 10 miles from the eastern end; the other, called the Vahinatika pass, at the western end; from both of these, with winds between South and S.E., the current sometimes runs out, it is said, at the rate of 8 or 9 knots.

The Pucheva pass is easily recognised by the break in the wooded reef and by the flagstaff at the village on the starboard hand in entering; it is clean, deep,  $1\frac{1}{2}$  cables wide, and may be taken by any vessel; immediately inside, the channel is divided into three by two coral banks, and again either of these may be chosen according to the wind, but for a steamer the central one should be preferred, and she should anchor about 2 cables westward of the Tutakioere bank, having left that and the Rikiriki bank on the starboard hand in passing. The anchorage is good in 7 fathoms, sand and coral, about 2 cables S.S.W. of the wharf and abreast of the village of Pucheva, which is the seat of government of the district.

The Vahinatika pass, so named from a village 8 miles from it on the northern side, may be taken by vessels up to 16 feet draught; like the other pass, it is divided into three channels inside, by the interposition of two coral banks.

Although there are many coral banks and heads in the lagoon, vessels may pass from one village to the other, and even work to windward, it being only necessary to keep a good look-out from aloft.

The village of Vahinatika is 15 miles westward of Pucheva. There is good anchorage in the lagoon off the mole in 7 or 8 fathoms, about 2 cables from the shore. The *Mésange* entered the lagoon by the Pucheva pass, visited and anchored off each village, and left by the Vahinatika pass.

The western side of the Pucheva or N.E. pass is in lat.  $16^{\circ} 36' S.$ , long.  $143^{\circ} 32\frac{1}{4}' W.$

**Supplies.**—Pigs, fowls, and good water may be obtained.

**Tides.**—It is high water, full and change, in the Pucheva pass at 3 hours.

**Caution.**—In addition to the strong currents caused by southerly winds as before stated, the ebb tide frequently sets out through the passes

\* See chart, No. 767. Also plan of North-east pass, scale,  $m = 3$  inches, on No. 1,175.

with great strength; vessels under sail should, therefore, not attempt to enter except on the flood tide, without first acquiring a knowledge of the state of the stream in the pass.

**KATIU** or Saken island is an atoll discovered by Bellingshausen in 1822; it is very low, not wooded on its southern or south-western sides, but in other parts covered with brushwood and occasional groves of cocoanut trees; the atoll encloses a lagoon into which there are two passes, one, the Toini pass, in the north-eastern part near the North point, suitable for schooners, which enter and moor to a wharf in front of the village; the other pass in the south-western part is smaller and only fit for boats.

The village of Toini, with a population of about 80, is situated near the pass of that name. The atoll is about 15 miles long N.W. and S.E., by half that width.

Pearl shell is found in the lagoon.

The West extreme is in lat.  $16^{\circ} 22' S.$ , long.  $144^{\circ} 28' W.$

**RAEFFSKY ISLANDS** consist of the three small atolls, Hiti, Tuanaka, and Tepoto; the last named was discovered by Bellingshausen in 1820. It was reported in 1880 that Katiu and the Raefsky groups are not placed in relatively correct positions on the charts; as bearings taken from a ship gave impossible results. There is no record of any examination since that date, but French descriptions place Tuanaka, relatively to the others, 5 miles farther westward than our charts or description as below.

**Hiti** or Eliza atoll, the easternmost, is uninhabited, very small, has a lagoon without an entrance, and lies in lat.  $16^{\circ} 42' S.$ , long.  $144^{\circ} 9' W.$

**Tuanaka** or Reid atoll, the northernmost and largest, is thickly wooded, but uninhabited; there is a small passage into the lagoon for boats on the northern side.

The centre is in lat.  $16^{\circ} 41' S.$ , long.  $144^{\circ} 14' W.$

**Tepoto** or Ofiti atoll, the southernmost, is in lat.  $16^{\circ} 48' S.$ , long.  $144^{\circ} 19' W.$  It is thickly wooded and has a boat entrance into the lagoon on the northern side; the tide runs so strongly, however, that it can only be entered on the flood. In fine weather, boats can land on the reef on the western side.

**MOTUTUNGA** or Adventure atoll was discovered by Cook in 1773. It is very low, especially on its southern side, which has no vegetation from end to end; but, on the northern side it is wooded for its whole length in clumps on the islets; it is about 8 miles long East and West and has an extreme width of 5 miles about the centre. The atoll encloses a



lagoon, into which there are two passes; that near the North point is a boat passage only; the other, on the north-western side near the western point, is used by small vessels, but can only be entered at slack water; they moor in the pass opposite the village of Marokupenga. The island is, however, only inhabited during a portion of the year. There are cocoanuts; also a little pearl shell.

The N.W. entrance is in lat.  $17^{\circ} 3' S.$ , long.  $144^{\circ} 25' W.$

**TAHANEA** or Tchitchagov atoll, discovered by Bellingshausen in 1820, is about 25 miles long East and West and has an extreme width of 10 miles; it is generally inhabited, the people of Katiu and of Faaite having plantations of cocoanuts here. It is wooded the whole length of the northern and north-eastern sides, but quite bare on the south-eastern and southern sides.

**Passes.**—There are three passes into the lagoon on the north-eastern side of the atoll, all close together;—The Otaho pass 6 miles from the eastern end is shallow and only fit for small craft;—The Manino pass, just West of the first described, is practicable for large vessels, and the anchorage within is about  $1\frac{1}{2}$  cables from an islet in the lagoon on the starboard hand in entering;—The Motupuapua pass, just westward of the Manino, is also practicable for large vessels and is not so long; there is anchorage on either side of it within the lagoon.

As with nearly all these atolls, the lagoon is full of coral heads with deep water between them.

The N.W. point of Tahanea is in lat.  $16^{\circ} 46' S.$ , long.  $144^{\circ} 58' W.$

**ANAA** or Chain island is an atoll discovered by Cook in 1769; it is 19 miles long N.W. and S.E. and has an average width of 6 miles; it is the best cultivated and still has the largest export trade of any island of the whole group.

It is said to have formerly contained 5,000 inhabitants, which is more than the present population of the whole archipelago; this large number was accounted for by its conquest of the other islands, and enslaving their inhabitants. In 1874, the population was estimated at 1,500, but at present it is only about 700. This is no doubt owing to the disastrous hurricane of Feb. 7, 1879, which destroyed every building in the island, including the Residency, with the single exception of the R.C. Church, and destroyed the coconut plantations, from the cultivation of which, in 1873, copra was exported to the amount of 900 tons; the island has been extensively re-planted, but it is no longer the seat of government of the whole group, the Resident being now stationed at Fakarava island.

The atoll is wooded all round, and there is no entrance to the lagoon, but the shores are fairly easy of approach on the lee side. The best landing, and the place where trade is carried on, is at the village of Tuuhora, on the northern part of the atoll, where is the church and mission station before referred to; there are four other villages on the island.

In 1860, the natives cut a passage through the reef for boats to approach the village, near a small circular islet, in lat.  $17^{\circ} 20' S.$ , long.  $145^{\circ} 30' W.$  This cutting is entirely destroyed and closed, but a mooring buoy is placed off the landing place for the convenience of trading schooners; its being in position can, however, by no means be depended on.

It is said that a curious effect, apparently of *mirage*, is produced in certain conditions of weather by this island. Its shallow lagoon projects on the clouds a beautifully clear greenish reflection of itself, which is seen at a great distance.

**FAAITE** or Miloradowitch island is an atoll discovered by Bellingshausen in 1819. It is 15 miles in length W.N.W. and E.S.E. and about 5 miles broad. At the north-western end is an opening, easily recognised by some groups of cocconut trees, several houses, and a white pyramid. Here small vessels up to 60 tons may enter and moor about 100 yards within the lagoon. The island is well wooded near the western end, and there are some clumps of trees on the northern and north-eastern parts, but the southern side is merely reef, and very dangerous of approach at night.

Good water is in greater abundance here than in the other islands, but difficult to procure.

The N.W. extreme is in lat.  $16^{\circ} 42' S.$ , long.  $145^{\circ} 22' W.$

**FAKARAVA\*** or Wittgenstein island was discovered by Bellingshausen in 1819. It lies in a N.W. by N. and S.E. by S. direction; the western side slightly convex, the northern, eastern, and southern sides concave towards the ocean. The lagoon enclosed by this atoll is 32 miles long and about 10 miles wide, rectangular in form, and having three entrances, one at the northern end, the other two at the southern end. The lagoon has but few dangers and a perfectly safe channel for large vessels from one end to the other might easily be buoyed. In the south-eastern angle of the lagoon is a sheltered place where a vessel might safely be careened for repairs.

**Caution.**—It is reported that many sorts of fish in this lagoon, or caught near the reefs, are poisonous.

On the whole south-western side of the encircling reef are only six small islets situated about one mile from the outer edge of the reef, and only

---

\* See chart, No. 767; and plan on sheet of plans, No. 1,175.

two, or at most three, can ever be in sight from a vessel outside the reef at one time; the northern and north-western sides are generally well wooded and have numerous clumps of cocoanut trees. The eastern side and south-eastern point are wooded, but the southern end only sparsely so, except in the vicinity of the Tetamanu pass. The hurricane of 1878 passed over this atoll and caused much damage to the trees.

**Dangers.**—A reef awash extends a considerable distance both from the north-western and south-western points of Fakarava.

**Population, &c.**—The total population in 1894 was estimated at about 200; of these, about 80 reside in the village of Rotoava in the north-eastern angle of the lagoon, and, with the exception of the newly-erected Residency and a few government buildings, it is but a wretched collection of huts; about 100 also live at the village of Tetamanu at the southern end of the lagoon and on the eastern side of the pass of that name.

**Passes.**—Three passes lead into the lagoon, viz., the Ngaruae or North pass; the Tetamanu, Tumakohua, or South pass; and a small boat pass near the south-eastern point of the island, which, as it can only be used by small boats under favourable circumstances, needs no further notice.

**Ngaruae or North pass** is near the centre of the northern end of the atoll, and is about 7 cables wide, with a least depth of 6 fathoms; it is quite free from dangers, short, and suitable for large vessels; steamers commanding a speed of 8 knots can enter at any time; it is in fact the best pass in the whole of the Tuamotu group, and although the current runs out with great strength it follows the axis of the pass. The eastern side of the entrance is bordered by a thick grove of cocoanut trees, and the western side by a low sandy point on which is a pole surmounted by a triangle supposed to be painted white, but so small and badly maintained as to be almost useless as a beacon.

Sailing-vessels should enter or leave either during slack water or with the tide, and should keep nearest the eastern side. After entering, Puniu reef, which dries 3 feet and on which are two white beacons, should be left on the port hand, giving it a berth of about 300 yards. About 3 cables W. by S. of Puniu reef, in line between it and the eastern entrance point, is a bank with only  $2\frac{3}{4}$  fathoms water, and a reef barely covered at low water extends to the southward from the barrier reef nearly off to the Puniu reef.

Between Ngaruae pass and Rotoava anchorage, two coral patches which dry at low water are marked by beacons; a third, with 7 feet water,  $1\frac{1}{2}$  miles W.S.W. from Rotoava pier is marked by a black buoy; and a fourth with only 4 feet is unmarked.

**Rotoava anchorage** is about  $5\frac{1}{2}$  miles E. by N. from the Ngaruae pass, and the locality may be recognised by a flagstaff on a white pyramid visible from 2 to 3 miles. The line between Puniu reef and the pier on which this pyramid stands is free from danger, as the rocks with beacons and that marked by a black buoy can all be distinctly seen and should be left on the starboard hand. Moderate sized vessels anchor in from 7 to 10 fathoms, sand and coral, with the pyramid bearing N.N.E.; large vessels anchor farther westward. There are several coral reefs near the shore at the anchorage, but the two outermost, which dry 3 feet at low water, are each marked by red beacons, viz, the Tapaeroa and the Kopoapiro reefs.

The anchorage is excellent in winds from W.S.W. through North to S.S.E. South-easterly winds raise a slight sea, but with winds between S.S.E. and W.S.W. the sea is heavy.

The pyramid on Rotoava pier is in lat.  $16^{\circ} 2\frac{1}{2}'$  S., long.  $145^{\circ} 38\frac{1}{2}'$  W.

**Supplies.**—Pigs, fowls and eggs are procured with difficulty both at Rotoava and at Tetamanu. Fairly good water may be found at both places by digging.

**Tetamanu, Tumakohua, or South pass** is a little eastward of the extreme southern point of the island. On approaching from seaward four clumps of cocoanut trees distinctly more prominent than others will be seen eastward of the South point; the pass is between the third and fourth of these clumps reckoning from the westward; it is deep and capable of being used by the largest vessels, but is somewhat intricate, and for such would require to be buoyed or beacons, consequently it is not recommended for vessels drawing over 15 feet. At its inner part, it is divided into two by the interposition of a coral reef, the passage to the right of which is only fit for small craft, that to the left being the deep water channel, though from the number of black rocks on this reef and on that extending from the barrier reef, this, the best passage, appears as seen from seaward to be blocked by rocks.

The anchorage is north-westward of the village of Tetamanu and is approached by passing northward of two banks nearly dry; it is close to the shore in from 6 to 8 fathoms, sand and coral. It is much exposed to north-westerly winds.

**Tides.**—It is low water at Tetamanu about 2 hours before the moon's meridian passage.

**Bank.**—A bank, the position of which is doubtful, is shown on the chart about midway between the north-western extreme of Fakarava and Niau island. This bank has been unsuccessfully searched for by French vessels of war on several occasions, notably so by the *Vire* in 1886, which vessel passed no less than seven times over the spot assigned to it.

**Current.**—In the channel eastward of Fakarava, the currents are often very strong and uncertain. In one night, in this vicinity, the French vessel *Taravao* was set 30 miles to the eastward.

**RARAKA.**—This nearly circular atoll was discovered by Captain Ireland in 1831, it is about 14 miles in length in a N.W. and S.E. direction, by 11 miles in width. The northern side is wooded, and on the southern side are seven small wooded islets, but towards the south-eastern and south-western parts the reef is very low and bare.

There is an entrance pass into the lagoon on the north-western side in lat.  $16^{\circ} 4' S.$ , long.  $144^{\circ} 59' W.$ , navigable for vessels of 100 tons, but the current runs out constantly and very strongly, with south-easterly winds prevailing. The small village of Matahai, with about 50 inhabitants, is situated near and on the eastern side of the pass.

Inside the lagoon facing the pass is an islet and a coral bank, and there is a narrow passage between the latter and the shore, which may, in case of necessity, be taken; the anchorage in about 7 fathoms is beyond this bank, and it is in general necessary to make a tack to fetch it; a pilot should, however, be obtained before entering.

**KAUEHI** or Vincennes island is an atoll discovered by Captain FitzRoy, H.M.S. *Beagle*, in 1835. It is 12 miles long North and South, by 9 miles wide; is very low and wooded except in the south-eastern part, where there are no trees for a space of 3 or 4 miles, and this part is very dangerous to approach at night. The pass into the lagoon is on the southern side and is 100 yards wide, leading through the reef in a N.W. and S.E. direction, and has 15 fathoms water; the tides in the pass run with great strength.

The lagoon is fairly clear as far as is known except near the sides, where detached patches of from 3 to 6 feet will be found, but in its navigation a good look-out should be kept from aloft for coral heads.

The anchorage is about 9 miles N. by E. from the pass, where there is a village with about 250 inhabitants, and at about  $1\frac{1}{2}$  miles southward of the anchorage is the small wooded islet Tutu.

In steering for the anchorage, after clearing the pass, steer about N.E., and a rock above water will soon be seen on the port hand; when clear of it, steer for the village and leave another rock, awash, about S. by W. from Tutu island a cable distant on the starboard hand; afterwards, another rock awash, and one which does not always break, have to be left on the port hand, and the anchorage is between this latter and the southern point of the village in 8 fathoms, sand and coral.

The anchorage is in lat.  $15^{\circ} 50' S.$ , long.  $145^{\circ} 8' W.$

**TAIARO** or King atoll, in lat.  $15^{\circ} 46' S.$ , long.  $144^{\circ} 37' W.$ , was discovered by FitzRoy in 1835. It is rather higher than usual, nearly circular, about 3 miles in diameter, and thickly covered with trees and shrubs, which surround a lagoon into which there is no pass. The best landing place is on the western side near some native huts. With winds between East and S.E., small craft may make fast to the reef in this part. There are no regular inhabitants, but the island is visited at certain times by the natives of Kauehi.

**ARATIKA**, or Carlshov island, is an atoll discovered by Roggewein in 1722, and was named Carlshov by Kotzebue in his second voyage. It is triangular in shape; the northern end is 8 miles in length East and West, and the eastern and western sides rather longer and terminating in a point to the southward. The whole of the northern part is thickly wooded, and the highest point is at the north-western angle, where it is 12 feet above low water. The eastern, southern, and western parts of the reef are low and dangerous of approach at night. The island is visited at times by the people of Kauehi, but has no permanent population.

There are two entrances to the lagoon, one on the western side, the other on the eastern side. The latter is tortuous and with many rocky patches, and is only fit for small craft acquainted with the locality. The former, called the Temakota pass, is the best; it is about 60 yards wide and 200 yards long before it opens out into the lagoon, where great care is required to avoid the numerous coral heads. In coming from the westward, the position of this pass may be known by its lying between the largest of the wooded islets on the western reef on the starboard hand, and a small clump to the northward of it on the port hand.

The entrance to the Temakota pass is in lat.  $15^{\circ} 33' S.$ , long  $145^{\circ} 33' W.$

**Caution.**—The fish in Aratika lagoon are stated to be poisonous.

**TOAU**,\* or Elizabeth atoll, is according to the Admiralty chart about 23 miles in length W.N.W. and E.S.E., and 11 miles wide, but according to French official descriptions it is only 15 miles in length. The north-western side is well wooded to within a few miles of the western point; on the southern side there is a small wooded islet about 4 miles eastward of the western point; eastward of this islet, the sea breaks continuously on the reef, which is very low and scarcely ever dry. The north-eastern side is wooded at intervals; the greatest space without vegetation is just westward of the Otuni pass. The eastern point is well wooded.

The island is only inhabited at certain seasons of the year by people from Fakarava.

---

\* See chart, No. 767; and plan of Amyot bay on sheet of plans, No. 1,175.

**Passes.**—There are two passes into the lagoon, both are on the north-eastern side, they are named the Orepa and Otuni passes :—

**Orepa**, the western of the two passes, is several miles westward of the Otuni pass, but, although it is nearly 2 cables wide, is only adapted for small vessels, and by them should not be attempted except at slack water. There is anchorage on either side inside the pass.

**Otuni pass**, the easternmost, is about 3 miles from the East point of the atoll ; it is wide, clean, and safe for vessels of considerable size, having from 22 to 26 feet water ; there is ample room for small vessels to work in. The eddies are very strong and have been felt 4 miles outside the entrance. The best anchorage inside is between 5 and 6 cables southward of the pass.

**Matariua anchorage**, or Amyot bay, which is said to afford shelter in all winds, must be a dangerous anchorage if the wind should come from the N.W. ; it is a small horse-shoe shaped bay in the outer side of the reef in the north-western part of the atoll, and being a somewhat confined anchorage, vessels should moor and secure to the reef.

**Caution.**—All the fish in Toau lagoon are said to be poisonous.

**NIAU**, or Greig atoll, the North point of which is in lat.  $16^{\circ} 7' S.$ , long.  $146^{\circ} 23' W.$ , is about 4 miles in diameter, several feet above the water level, well wooded, and visible for a distance of 10 or 12 miles. It is a good land-fall to make when bound from Tahiti to Fakarava. The fringing reef extends a very short distance from the shore.

The hurricane of 1878 devastated this island ; many of the inhabitants were washed into the lagoon by the surf and drowned ; a few were saved by tying themselves to trees. The lagoon was merely a large fresh-water pond 12 feet deep until that time, but the water is now brackish ; it has no communication with the sea, but contains great numbers of excellent fish, named *Ava*, of the flavour of salmon.

The village is on the north-eastern side, where there is fairly good landing ; there is another and more convenient landing-place on the western side of the island, on a sandy beach, in front of the old village, and there is a road leading from it to the present village. In landing at either place, it is always best to ensure having a gang of natives ready to haul a boat instantly on to the reef, or up the beach as the case may be.

**KAUKURA**, or Aura island, is an atoll about 25 miles in extent W. by N. and E. by S., and has an extreme width, near the middle, of about 8 miles. This island was completely devastated by the severe hurricane of 1878, the houses destroyed, cocoanut plantations demolished,

and vegetation generally so completely destroyed that for some years the atoll was not visible until close upon it, with the remarkable exception that, especially on the southern side, several enormous blocks of coral, some of them 30 feet high, washed up by the sea during the hurricane, were, and remain, visible for about 10 miles.

Since 1878, the island has been extensively replanted and has resumed much of its former appearance; the northern side is wooded from end to end, but there are only two clumps of trees along the southern side. There are two villages, Panao on the north-western side, where communication is most frequent, and Motuura on the northern coast.

**Passes.**—At Panao, a few miles from the western end, there is a boat entrance, off which the tides run with great strength. Vessels wishing to communicate with Panao must beware of northerly winds, and should also know that the tide commonly sets westward from 7 a.m. to 1 p.m., and eastward from 1 p.m. to 7 p.m.

The Motuura pass, near the centre on the northern side, may be known by the large groves of cocoanut trees, and by the ruined houses in the vicinity; it is only fit for vessels of about 15 tons; the streams off the pass follow the same rule as mentioned before, running eastward with the flood and westward with the ebb.

The western point of Kaukura is in lat.  $15^{\circ} 40' S.$ , long.  $146^{\circ} 51' W.$

**APATAKI**,\* or Hagemeister island, the north-eastern point of which is in lat.  $15^{\circ} 18' S.$ , long.  $146^{\circ} 12' W.$ , was discovered by Captain Hagemeister in 1830. It is about 18 miles in extent North and South, and 15 miles wide; it is wooded except on the southern side, where the reef is under water; this part is especially dangerous by night, and in calm weather when the breakers do not show; the currents are also very strong.

This atoll has three passes on its western side leading into the lagoon; the southern pass, known as the Pakaka pass or Schooner passage, and the northern named Tehere, are navigable for vessels; the middle pass, Avatika, can be used only by small craft, and by them with difficulty.

Pakaka pass is about 5 miles north-westward from the southern point of the atoll, and is just where the western side begins to be wooded; it is about 160 yards wide, and after entering bends to the southward. A white beacon stands on the southern side close to the chief's house. The tides are strong in the pass, but there is a little creek on the southern side where vessels up to 400 tons can moor out of all tide and thoroughly well sheltered. Only vessels of less than 7 feet draught can proceed beyond the pass into the lagoon.

---

\* See chart, No. 767; also plan:—Pakaka to Seignelay point, on sheet of plans, No. 1,175.



The Tehere pass, on the north-western side and near the N.W. point, is practicable for large vessels, and the entrance is clear and easy; the anchorage is inside the lagoon on either side of the pass.

The population of the island is about 150, and the only village is that at the Pakaka pass.

**ARUTUA**, or Rurick island, of Kotzebue, is an atoll about 18 miles in extent and nearly circular. On its northern side and part of the eastern side there are cocoanut groves and brushwood, but the southern and western parts are quite bare and a considerable portion of the reef submerged. On the eastern side is the Brovaki pass, which is very indifferent, but gives small vessels access to the lagoon. On the north-western part, marked by some large clumps of cocoanut trees, is a second pass, only accessible to boats.

The natives are of Tahitian origin; they were, in 1894, about 100 in number and all were Mormons.

The South point is in lat.  $15^{\circ} 26' S.$ , long.  $146^{\circ} 44' W.$

**TIKEI**, or Romanzov island, discovered by Kotzebue in 1815, is a small wooded coral island about 10 miles in circumference and having no lagoon. It may be seen from the deck of a small vessel about 12 miles distant. There is a small village at the western point, where is the only and very difficult landing place. The natives, about 30 in number, are all from the island of Takaroa, and there are many cases of elephantiasis among them.

The centre of Tikei is in lat.  $14^{\circ} 56' S.$ , long.  $144^{\circ} 33' W.$

**KING GEORGE ISLANDS** was the name applied by Byron in 1765 to two atolls named respectively Ura or Takapoto, and Tiokea or Takaroa; they had, however, been previously discovered, Tiokea having been seen by Roggewein in 1722.

**Ura** or Takapoto is about 13 miles long N.N.E. and S.S.W., and not more than 4 miles wide; it has no pass into the lagoon, and the whole circuit of the atoll is wooded. There are about 80 inhabitants, most of whom are Mormons.

Boats can land at a place named Fakatopatere about 5 cables northward of the South point and on the western side of the island. There is also landing 2 or 3 miles farther northward on a part of the reef named Okukina; here, in fine weather, schooners sometimes make fast to the reef.

The South point of Takapoto is in lat.  $14^{\circ} 44' S.$ , long.  $145^{\circ} 14' W.$

**Tiokea\*** or Takaroa is 15 miles in length, N.E. and S.W., and about 5 miles wide; it is wooded in clumps on all sides. On the north-western side and near the south-western end is the Tehavaroa pass, which

\* See chart, No. 767; and plan of Tiokea entrance, on sheet of plans, No. 1,175.

admits vessels of 9 feet draught. The village, with a population of about 180, all Mormons, is on the northern side of the pass. A large white pyramid on which is a flagstaff, at the S.E. extreme of the wharf in the lagoon, is visible from seaward, and is a good mark for the entrance, in which the tide is seldom strong enough to prevent a vessel from entering far enough to anchor, when she can either be warped in, or wait until the flood tide and then secure to the wharf. The pass is about 150 yards wide and quite straight for upwards of a mile on an E.  $\frac{1}{2}$  N. and W.  $\frac{1}{2}$  S. line.

The flagstaff on the pyramid is in lat.  $14^{\circ} 28\frac{1}{2}'$  S., long.  $145^{\circ} 0'$  W.

There is good temporary anchorage outside the pass near the northern reef, cut of the stream, in 9 or 10 fathoms. Vessels often anchor here until a gang of natives have been procured to track them in.

Vessels moored to the wharf are safe, even with winds blowing from the entrance; the inhabitants say, that during the hurricane of 1878, when the sea swept away the houses, not one vessel, well secured, was in any danger, for the water coming from the land formed a counter current which kept the ships away from the wharf; with strong westerly winds it is better, however, to haul farther in.

**Supplies.**—Fish, fowls, and eggs can be obtained and water is abundant.

**MANIHI\*** or Waterland atoll was probably discovered by Le Maire and Schouten in 1616; it is about 15 miles in length N.E. and S.W. and 6 miles wide. Coconut trees flourish on the islets, which are numerous all round this atoll, and fresh water can be procured on the south-western side, where the land is about half a mile wide. The total population amounts to about 180, nearly all Mormons, and there is a flourishing village on the eastern sides of the pass, in which is a Mormon temple and a Roman Catholic church.

The hurricane of 1878 caused great destruction in this island and much damage to the coconut trees.

**The Pakua pass** is at the south-western end of the atoll. Its direction is about N.N.E.; it is deep, narrow, long, and straight. The tides are very strong and it can only be entered or left at slack water. The schooners trading here generally moor in the pass, head and stern, close to the village mole, but this is not safe if the wind comes from the south-westward or northward. In such a case a vessel should, with the assistance of a pilot, enter the lagoon and moor near a landing place in the S.W. angle, from which place there is a road to the village.

---

\* See chart, No. 767; and plan of Manihi entrance, on sheet of plans, No. 1,175.

Manihi is one of the most productive islands of the whole archipelago, not only in copra, the product of the cocoanut, but pearl shell is very abundant and of high quality. The lagoon is full of coral shoals.

The East end of Manihi is in lat.  $14^{\circ} 23' S.$ , long.  $145^{\circ} 50' W.$

**AHII**,\* or Peacock island, is an atoll, very similar to that last described, and lies about 12 miles westward of it. Its south-eastern side is about 14 miles long N.E. and S.W. and nearly straight, the other side forming a bow, from the south-eastern side to which the greatest width is about 7 miles. The whole atoll is wooded, but is only peopled at certain times of the year by the natives of Manihi. The village is at the south-eastern part of the atoll.

The pass leading into the lagoon is on the north-western side and is both deep and wide, but the water immediately shoals on entering the lagoon; it has hitherto been considered as fit for boats or small craft only, but by the latest French information it gives access to vessels of 1,000 tons, and there is stated to be good anchorage near the village and also in the N.W. angle of the lagoon.

No stranger should attempt to proceed beyond the pass without a pilot.

The entrance pass is in lat.  $14^{\circ} 30' S.$ , long.  $146^{\circ} 21' W.$

**Currents.**—It has been found that during easterly winds the current, though usually setting westward, is feeble in the vicinity of Rahiroa island.

**RAHIROA**\* or Rangiroa, the largest of the Tuamotus, also named by various navigators Vliegen, Deans, and Nairsa island, consists of a coral belt, very narrow, and covered with cocoanut and other trees throughout, except for a short distance near the south-eastern point, and again near the south-western point. The reef encloses a lagoon about 42 miles in length, E. by S. and W. by N., and of an extreme width of 14 miles.

The lagoon is so infested by sharks that agriculture has almost entirely superseded pearl fishery as the industry of the island.

There are two villages, that of Tiputa, with about 250 inhabitants, and Avatoru, with about 230 people. Both are on the inner side of the reef. Tiputa has a Roman Catholic Church and a Mormon temple; Avatoru, a church only.

**Passes.**—Three passes, Tivaru, Avatoru, and Tiputa, lead into the lagoon; the first, on the north-western side, the two last, both fit for large vessels, on the northern side.

**Tivaru** pass, only fit for small craft and boats, is about half way along the north-western side of the atoll.

---

\* See chart, No. 767; also plans of Ahii and Avatoru lagoon entrances on sheet of plans, No. 1,175.

Northward of the Tivaru pass and close to the N.W. point of the atoll is an inlet in the reef forming a little harbour, and called by the natives Avatika; this word wherever used signifies a pass with its inner end closed by reef.

**The Avatoru pass** is the western of the two openings into the lagoon on the northern side, and is near the N.W. point. This pass is deep, free from dangers, 2 cables wide, and is navigable by large ships, but it is advisable to go through either at slack water or with a favourable tide, as the eddies are sometimes strong; the least depths obtained by the French war vessel, *Mésange*, were  $6\frac{1}{2}$  fathoms at the entrance and  $8\frac{1}{2}$  fathoms near the inner part of the pass.

The village commences in the pass on the eastern side and extends round this inner point eastward for 500 or 600 yards. At the eastern end of the village, a mole has been built upon some reefs nearly level with the water, enclosing a space in which the native craft take shelter from the heavy sea in the lagoon, which sets in with strong south-easterly winds.

Facing the pass on entering is Brander islet, on either side of which is a channel. A reef extends from its southern point  $1\frac{1}{2}$  cables into the lagoon. Shoal water also extends a short distance off the northern point of this islet into the pass, and also from the inner eastern point of the pass, but both reefs are distinctly visible.

**Anchorage.**—The anchorage for large vessels is in the pass westward of an old landing place; it is good except with northerly winds, but the ebb stream sometimes runs from 4 to 5 knots, and for 9 hours, whilst the flood runs about 2 knots for 3 hours only. A small vessel can moor with the starboard anchor about 80 yards from the old landing place mentioned, and with a hawser from the port bow to the shore. An eddy then keeps her swung with her stern inshore out of the strength of the tide.

The inner anchorage, off the eastern end of the village, is about 200 yards off the mole. Entering by the eastern channel, give the village point a berth of from 80 to 100 yards; small craft anchor about 80 yards from the wharf in  $5\frac{1}{2}$  fathoms, and secure to an anchor on the coral northward of the wharf.

The Avatoru pass is in lat.  $14^{\circ} 57' S.$ , long.  $147^{\circ} 44' E.$

**Tiputa pass** is the eastern of the two openings on the northern side of Rahiroa island; it is narrower than the Avatoru pass, more tortuous, and the streams are stronger, sometimes running from 7 to 8 knots, but it is practicable for large vessels. The village is on the eastern side and inner part of the pass. There is a low islet on the western side of the

inner part, with a reef extending 3 cables southward from it into the lagoon.

About 5 cables eastward of and inside the pass, is a small mole which gives the native craft sufficient shelter against the sea from the South-east.

The anchorage is about  $2\frac{1}{2}$  cables off-shore, eastward of the mole, in 10 or 11 fathoms, coral and sand.

**Caution.**—In the Avatoru and Tiputa passes, the tidal streams cause strong rips or eddies (opape), which are dangerous for boats; during the flood they are found at the inner parts of the passes, and during the ebb near the outer parts.

**Dangers.**—Within the lagoon, there is a coral bank about 3 miles S.S.E. of the wooded islet Avatoru; a second bank about 8 miles S. by E.  $\frac{1}{2}$  E. from the Tiputa pass is of circular shape, about 150 or 200 yards in diameter, and has over it about  $2\frac{3}{4}$  fathoms. There are also three wooded islets in the lagoon, but no other dangers are known either to the natives or pilots. Soundings of from 17 to 19 fathoms were found about 6 miles southward of Tiputa.

**TIKEHAU** or Krusenstern atoll, about 8 miles westward of Rahiroa, was discovered by Kotzebue in 1815; it is circular in form, about 10 miles in diameter, and is remarkable from having a small island thickly overgrown with trees in the centre of the lagoon. The atoll presents the appearance all round of a series of thickly wooded islets, large and small, which are very productive. The inhabitants cultivate cocoanuts and taro; in 1891, they numbered about 200. The old village was close to the pass, but in 1886 the inhabitants deserted this spot *en masse* and established a new village on the southern side of the lagoon, about 8 miles from the pass.

**Tuheiaua pass**, on the western side, is suitable for vessels up to 60 tons, and is in lat.  $14^{\circ} 58'$  S., long.  $148^{\circ} 14'$  W. The French war vessel *Taravao* attempted to enter, but could not succeed, as she found the stream always running out and very strong. This cannot always be the case, as schooners enter and cross the lagoon to the village; there are several patches of coral in the way, but with a favourable light and a look-out aloft they are easily avoided.

Northward of the pass, and outside, there is a bank where vessels may anchor in 8 or 10 fathoms, good holding-ground.

**MATAHIVA**, or Lazarev atoll, is about 4 miles in diameter and circular; it is the westernmost of the Low archipelago, and was discovered by Bellingshausen in 1820. There is a boat entrance pass on the north-western side. The atoll is well wooded all round without a break, except

at the pass, near which are a few huts, but the island is not permanently inhabited, the people of Tikehau visiting it at certain seasons only.

The West point is in lat.  $14^{\circ} 54'$  S., long.  $148^{\circ} 40'$  W.

**MAKATEA**, Matia, or Aurora island, the northern point of which is in lat.  $15^{\circ} 48'$  S., long.  $148^{\circ} 13'$  W., was discovered by Roggewein in 1712. It is a coral island, formerly an atoll, upheaved, and is about 5 miles in length W.N.W. and E.S.E., and half that width; the perpendicular cliff appears worn into caverns, and the height is 230 feet, rendering it visible for a distance of 20 miles. The fringing coral reef extends 500 feet from the cliffs on the northern side of the island, and gradually diminishes in width towards the western part. The northern, eastern, and western sides present perpendicular cliffs, but the southern side descends less abruptly.

The island is covered with vegetation and has some large trees; the northern portion is cultivated, and produces cocoanuts and sweet potatoes, chiefly on a narrow band of low land between the cliffs and the sea.

The village is in a bay in the middle of the north-eastern coast, and consists of about 30 houses. The inhabitants, formerly a thriving little community numbering about 100, are now terribly afflicted by elephantiasis.

On the western side of the island are several small openings in the reef, through which landing is practicable for boats during strong easterly winds. When between two thickly wooded hills on the western side of the island, the reef will be found to be steep-to, and can be approached to within 60 yards, thus avoiding the heavy sea and strong current. The landing at the village is very bad.

The few small vessels that visit this island remain under way, as there is no safe anchorage anywhere around the coast.

---

## CHAPTER V.

MARQUESAS ISLANDS.—THE LINE ISLANDS OR SCATTERED  
ISLANDS NEAR THE EQUATOR.

---

VARIATION IN 1900.				
Fatuhiva	-	-	7° 50' E.	Tongareva or Penrhyn
Eiao	-	-	7° 20' E.	island - - - 7° 50' E.
Caroline island	-	-	7° 35' E.	Jarvis island - - 7° 20' E.

---

## MARQUESAS ISLANDS.\*

**GENERAL REMARKS.**—The Marquesas archipelago is composed of two tolerably distinct groups, discovered at different times, and for many years bearing different names; they lie in a general N.W. and S.E. direction, between the parallels 7° 50' and 10° 35' S., and the meridians 138° 25' and 140° 50' W. They are all high and of volcanic origin, but have no active volcanoes, nor do they seem to be subject to earthquakes. The mountains are mostly central with ridges extending from them to the coasts, between which are valleys more or less fertile. They are of very broken irregular form, and may be seen in clear weather at a distance of from 50 to 60 miles.

The south-eastern group was discovered by Alvaro de Mendaña in 1595, who named them the *Islas de Marquesas de Mendoça*, in honour of the viceroy of Peru, who had despatched the expedition. The north-western group was not discovered until 1791, when the islands were sighted by Captain Ingraham, of the U.S. ship *Hope*, of Boston, and within two years they were visited by many others, and bore successively the names of Washington islands, Iles de la Revolution, Hergest islands, &c.

The southernmost island of the south-eastern group was the first sighted by Mendaña, and named by him La Madalena; he imagined it to be a portion of the Solomon islands discovered by him twenty-eight years previously. His first interviews with the natives were friendly, but the brutality of one of his men led to an outbreak and great slaughter.

Three others of the south-eastern group were named by him San Pedro, Santa Christina, and La Dominica. The remaining island, Fatu

---

\* See Admiralty charts :—Pacific ocean, general, No. 2,683; Pacific ocean, S.E. sheet, No. 733; Marquesas islands, No. 1,640.

huku or Hood island, was so named by Cook in 1774, after the midshipman who first saw it.

The north-western group consists of the six islands Ua-pu or Adams island, Ua-huka or Washington island, Nukuhiva or Marchand island, Motu-iti or Hergest rocks, Eiao or Masse island, and Hatutu or Chanal island. After their discovery by Captain Ingraham, they were visited in quick succession by Captain Marchand, of the French ship *La Solide*; by Lieutenant Hergest, in the transport *Dædalus*, who surveyed them in 1792; and in 1793 by Captain Josiah Roberts, of the American ship *Jefferson*.

**Population.**—The aboriginal inhabitants do not appear to have had any form of government, each tribe living separately and independently, occupying a valley formed between the mountain ridges; but for want of a head, quarrels and wars were frequent. At different periods missionaries endeavoured to establish themselves, with but little success; probably owing in great measure to the bad advice and example of white deserters from calling vessels, who were found living amongst the natives, having adopted their customs, and aiding in their disputes and wars.

The natives appear to have originally come from the West; the race is copper-coloured, of good stature, graceful form, and generally good looking but often much disfigured by tattooing. Unfortunately they are of a very indolent disposition, and are decreasing in number. The whole population of the islands in 1892 was estimated at 4,500 souls, which shows a decrease since the census of 1879 of no less than 1,254.

**Government.**—In May 1842, the state of anarchy was brought to an end by the whole united group, under the name of the Marquesas, being annexed by France, and French rule was in a few years firmly established. The seat of government under a Resident is at Tai-o-hae in Nukuhiva island, and the native chiefs act magisterially under his directions.

Nukuhiva, or Marchand island, is the most important of the group, and Tai-o-hae or Anna Maria bay is the principal settlement. The soil and climate of the whole group is peculiarly adapted for the growth of cotton, which is sent either to New Zealand or San Francisco for shipment to Europe.

**Communication.**—A line of American fore and aft schooners, subsidised by the French government, run their vessels monthly from San Francisco to Tahiti, calling at Tai-o-hae, or Anna Maria bay, *see* page 21. There is also a schooner eight times per annum between the Marquesas and Tahiti only.

**The Climate** of these islands, situated as they are in the very heart of the trade winds, is always warm and damp; notwithstanding, it appears

---

*See* chart, No. 1,640.



to be very healthy, agreeing equally well with Europeans and with natives; sunstroke is quite as rare as in Europe.

The islands are subject to a dry and rainy season, the line of demarcation between the seasons not being so clearly marked as is often the case, showers being often experienced in the dry season, and the rains being by no means continuous in the rainy season; May, June, and July are, however, the wettest months, when the rain often falls for days together in torrents; there is a good deal of rain also in January.

**Winds.**—From April to October, the South-east trade wind, called by the natives *tua-to-ha*, prevails in the vicinity of these islands. The general direction is E.S.E., but it varies between East and S.S.E.

From October to April, the prevailing wind, called by the natives *tiu*, is from E.N.E. veering and backing between East and N.N.E. The wind sometimes gets to the West of North, when it is apt to turn into a gale. Gales are, however, of rare occurrence, generally occurring in December if at all.

Land and sea breezes are commonly felt in the various bays around the islands, the former much more lasting than the latter, though both are light. The land breeze usually commences about 6 hrs. p.m., and lasts through the night; being at its greatest strength about 5 hrs. a.m., that is the best time for a sailing vessel to get under way. To enter a bay, a good time is about 9 or 10 hrs. a.m., with the first of the sea breeze, for it is very apt to die away quickly, and then it remains calm all day.

**The Current**, impelled by the prevailing trade wind, is usually to the westward, between W.N.W. and W.S.W., at a rate of about half a knot an hour, sometimes, however, increasing to 3 knots. If the wind dies away or changes to the westward, the current slacks, and during persistent westerly winds its direction changes. After a week of north-westerly winds, a current setting to the eastward at the rate of 3 knots was observed in Bordelais strait.

**Directions.**—All these islands are high and steep-to, and only ordinary precautions are necessary when navigating amongst them; sailing vessels, however, should not approach the land too closely, even with a fresh breeze, as the wind sometimes dies away suddenly and the swell and current set towards the projecting points. When working to windward for Nukuhiva, never stand to the northward of the parallel of that island, where calms and strong westerly currents are likely to be experienced.

When boating to places situated to windward, it is best to skirt the shore as closely as possible, to take advantage of any counter current which may be found, but caution is required, as the heavy broken seas encountered

near projecting points might render this course inadvisable for a loaded boat.

**Pilots** are hardly necessary in this group, but they may greatly assist sailing vessels in making a port by their knowledge of puffs and shifts of wind.

**Supplies.**—Cattle are abundant on the islands Nukuhiva and Tau-ata. The Roman Catholic mission has sheep on the island Ua-pu, and a number on Hiva-oa or Dominica island. Eiao is also stocked with cattle.

**FATU-HIVA** or Magdalena island, the southernmost of the Marquesas group, is 8 miles in length, North and South, and 4 miles wide; the highest point is 3,675 feet above the sea; *see* view on chart No. 1,640.

The eastern side of the island is extremely rugged, steep ridges coming down from the central mountain, and terminating in high precipices over the sea. Very few of the valleys or gorges reach the beach, so that, independently of the dangerous surf which dashes against the rocks, landing is impracticable on this side of the island. On the northern and southern ends the land slopes more regularly towards the sea, but on these parts also there is no landing.

Venus bluff, the S.S.W. point of the island, is a perpendicular rocky cliff about 700 feet high facing the sea, which breaks within a few yards of its base; from some points of view, the break of the sea assumes the appearance of a reef extending farther out than it really does.

**Anchorage.**—There are two anchorages on the western coast; one in Bon Repos bay near Venus bluff, the other in Hanavave bay about 4 miles to the northward. Both bays are open to the westward, and when westerly winds threaten it is necessary to put to sea.

**Bon Repos** or **Omoa bay**\* is easily found, being at the southwestern extreme of the island just northward of Venus bluff; the northern headland of this bay is a point of black rock 100 feet high. The anchorage is none of the best, and a heavy surf rolls continually on the beach, but landing can be effected on the rocks on one or the other side of the bay, according to the direction of the swell.

**Directions.**—A slender pinnacle rock of remarkable appearance about 320 feet high, and 750 yards inland from the head of the bay, rises vertically above the huts that line the shore; steer for this rock, known as *Pierre Bonhomme*, bearing East. Anchor on this bearing in 9 or 10 fathoms,  $1\frac{3}{4}$  cables from the shore.

---

\* *See plan on chart, No. 1,640.*

A stream enters the bay near the middle of the beach, and is of sufficient volume to produce a constant current setting out of the bay.

**Supplies.**—Water can be obtained, but with difficulty, as boats must lie a considerable distance from the beach off the mouth of the stream. The valley, which winds up among the hills from the head of the bay, is very beautiful, being covered with the rich foliage of tropical fruit trees, whilst the native cottages and huts, sheltered under the bread-fruit, cocoanut, and orange trees, add greatly to the attractiveness of the scene.

Fruit of all descriptions can be procured in sufficient quantities to refresh a large ship's company; but meat and vegetables are scarce, pigs and poultry being the only animal food.

**Hana-vave\*** or Virgin bay affords better anchorage than Bon Repos bay; there is also less swell, and landing is easier.

**Directions.**—Having made out the mission church, which can be seen from a considerable distance, keep it just open of the high land to the northward about E.  $\frac{1}{4}$  N. Anchor in from 19 to 23 fathoms soon after the outer coast of the island is shut in by the south-western point of the bay. The holding-ground is good and the squalls though violent are not dangerous; they blow out of the bay and the only risk is that of being blown off the land.

**Landing.**—There is a sandy beach at the head of the bay, where landing is almost always easy. Boats can also land alongside some flat black rocks on the northern side at the foot of some cliffs from 250 to 400 feet high.

The southern extreme of the beach is in lat.  $10^{\circ} 27' 6''$  S., long.  $138^{\circ} 39' 4''$  W.

**Supplies.**—Fruit, pigs, and poultry can be obtained here, but no water.

**Tides.**—It is high water, full and change, at about 3 hrs. 50 min.; springs rise  $3\frac{1}{2}$  feet.

**Caution.**—Sailing vessels passing to leeward of Fatu-hiva should not approach the land nearer than 3 miles as they are likely to be exposed to very strong squalls off Hana-vave and afterwards to calms and a heavy swell.

**THOMASSET ROCK**, discovered by the *Ariane* in 1844, is  $14\frac{1}{2}$  miles E. by N.  $\frac{3}{4}$  N. from the North point of Fatu-hiva in lat.  $10^{\circ} 21'$  S., long.  $138^{\circ} 25'$  W. The top is only 13 feet above the sea; great caution is therefore necessary when navigating in this vicinity at night.

---

\* See plan of Hana-vave, on chart, No. 1,640.

**MOTANE** or San Pedro island is 5 miles in length N.N.W. and S.S.E., 1,640 feet high, and wooded on the summit and in the ravines. Separated from the south-eastern point by a narrow boat channel is a large high rock, in lat.  $10^{\circ} 1' S.$ , long.  $138^{\circ} 48' W.$

The island is not permanently inhabited.

**TAU-ATA\*** or Santa Christina island is 9 miles long North and South, and 5 miles across in the widest part. A narrow ridge of mountains of considerable height extends the whole length of the island, the highest attaining an altitude of 3,280 feet. Other ridges, rising from the sea, join the main ridge with a regular ascent. These are separated by deep narrow valleys watered by fine streams of excellent water.

**Supplies, &c.**—The island produces cotton, cocoa, coffee, sugarcane, and fungus. There are wild cattle in the mountains, but difficult to get at, and still more difficult to carry away when shot. The inhabitants in 1880 were estimated at 450, but have decreased in number since then.

The formation of the island, with its steep coast on the East and numerous valleys on the West, closely resembles Fatu-hiva; the eastern side should therefore be carefully avoided, the only two possible anchorages, as now described, being on the western side.

**Vaitahu\*** or Resolution bay is near the middle of the western side of the island and under the highest land. The French settled in this bay in 1842, but subsequently abandoned it. The southern point of the bay is a steep rock of considerable height, terminating at the top in a peaked hill. The northern point is not so high, and rises with a more gentle slope. The points are about 5 cables apart, and the bay recedes about that much from a line drawn between them.

There are two sandy beaches at the head of the bay, divided from each other by a rocky point; in each there is a rivulet of excellent water. The northern cove, named Vaitahu, is the most convenient for obtaining firewood and for watering; here there is a small waterfall mentioned by Quiros; the village in the southern cove is named Hanamiai.

The sea breeze is rarely felt at this anchorage, but with northerly winds there is swell enough to cause a vessel to roll disagreeably. The rare winds from West and W.N.W. blow directly into the bay, but they do not produce a correspondingly heavy sea.

It is said that vessels have been driven to sea from this anchorage by the violent gusts down the valleys, and altogether the bay has such a bad character that whalers seldom enter.

**Directions.**—The best marks for finding Vaitahu bay are Fort Halley, built on a hill and visible from a long distance when bearing

---

\* See plans of Tau-ata, and of Vaitahu, on chart, No. 1,640.

between East and S.E.; and two large white houses on the beach. In any case, a vessel on the meridian of the western point of Tau-ata, and running North or South until the West extreme of Hiva-oa bears N. by W.  $\frac{3}{4}$  W., or until Bordelais strait appears completely closed, will be off Resolution bay.

Sailing vessels from the eastward with the trade wind should pass northward of the island and run down the coast. The breeze drawing along the land will carry them almost to the entrance. Entering the bay, skirt as closely as possible the northern point, which is steep-to. Whilst working in, watch the puffs carefully, and endeavour to avoid being struck by a gust from the hills when in stays.

**Anchorage.**—In 1867, H.M.S. *Topaze* anchored in 26 fathoms, with the western point of Hiva-oa bearing N.N.W.; and the southern extreme of land S. by W.  $\frac{1}{2}$  W.; she remained here for two days without experiencing any difficulty from the swell, or squalls from the mountains. There is no doubt, however, that a heavy swell from the south-westward does set in at times, for a landing place, constructed by the French at considerable expense, has been washed away, and there are other marks of destruction by the waves.

The best anchorage is in from 10 to 13 fathoms, sand, off the ravine marked by two cocoanut palms. The violent gusts down the valley may cause a vessel anchored on a sloping bottom to drag off, but if anchored well to the northward, she will clear the southern point of the bay.

**Landing.**—Boats can land, in fine weather, on the beach in the southern part of the bay, where there is no coral; but the usual landing place is at the steps cut in the rock to the northward of the beach.

**Water.**—In fine weather, excellent water, easily obtained, is to be had at the southern end of Vaitahu beach, where the spring bursts out from a rock and it is only necessary to suspend a hose under it and let the water run into the boat. Water can also be obtained in Hapatoni bay, but it is of inferior quality and the operation very difficult.

**Hapatoni bay**, 2 miles southward of Vaitahu bay, is a bad anchorage occasionally used by whalers. A rock resembling a tower on the southern point of the bay marks the entrance. Boats can generally land in a little creek sheltered by a point.

**BORDELAIS or HAAVA STRAIT**, separating Tau-ata from Hiva-oa, is  $2\frac{1}{2}$  miles wide, and both sides are clear and safe. There is nearly always a fresh breeze and a relatively rough sea in this channel. The current sets generally to the westward at from 2 to 3 knots, and when this is the case it is almost impossible to beat through to the eastward.

When westerly winds have prevailed for some time, the current is reversed and sets eastward with about the same velocity. See also page 147.

**HIVA-OA** or *Dominica* island is the largest, the most fertile, and the most populous of the whole group. It is 22 miles long East and West, with an average breadth of 6 miles. The highest mountain summits are *Heani* peak, 3,520 feet high, towards the western end of the island, and *Ootua* peak, 3,032 feet high, in the eastern half. It has some well-watered beautiful valleys, the soil is extremely rich and well suited for coffee, sugar, cotton, and other tropical products. Unfortunately the natives are reported to be both lazy and turbulent, consequently agriculture and trade make but little progress, though, since 1880, a few Europeans have settled in the island and both cotton and coffee are now being cultivated to some extent.

In 1880, the native population of *Hiva-oa* was estimated at 2,500.

*Cape Balguerie* is the eastern point of the island; the hill rises above it to the height of 1,280 feet, and at the foot are several isolated rocks, the northernmost of which is in the shape of a truncated cone. The coast westward of this consists of barren cliff and white sandy beach without shelter or inhabitants for a distance of 5 miles, at which distance, on the northern side, is *Puamau* bay.

**Puamau\*** or *Périgot* bay may be recognised by its wooded amphitheatre and the mountains around, the westernmost of which is 2,820 feet high. The hill on the eastern side is 575 feet high and is surmounted by a natural obelisk or column composed of two vertical rocks separated by a fissure, but which in certain positions appear as one rock. The Roman Catholic mission, also the fort at the head of the bay, are good marks.

This place is populous but has few resources, though a few traders have established themselves here, and it seems destined to become a place of some importance.

About  $1\frac{1}{2}$  cables from the eastern point, and within the bay, are the *Jacquemart* rocks; coming from the westward they cannot be distinctly made out. Although the depth between these rocks and the point is from 7 to 9 fathoms, it is advisable to pass westward of them, and also of the *Boulard* shoal, one cable northward of these rocks, on which there are  $2\frac{3}{4}$  fathoms. Sailing vessels should invariably observe this rule, as the wind is very apt to die away near the land.

**Anchorage.**—The best anchorage is in from 10 to 12 fathoms, good holding-ground, with the following bearings: *Bastion* point, the western point of the bay, in line with the eastern point of *Fatu-huku* N. by W.  $\frac{1}{4}$  W. ;

---

\* See chart, No. 1,640; plan of *Puamau* bay.

and the obelisk on the hill over the eastern point of the bay, seen between the two Jacquemart rocks, E.  $\frac{3}{4}$  S.

During the years 1880 and 1881, the French war vessel *Chasseur* anchored frequently at Puamau bay in all kinds of weather. There is always a swell, and with the wind to the northward of East, vessels roll very disagreeably.

With a fresh breeze from N.E. to N.N.W. the sea becomes heavy in the bay. Steam-vessels have little difficulty in putting to sea, but sailing vessels often find some difficulty, especially during the season of N.E. winds, from October to April; the land breeze frequently fails, and as both swell and current set directly against Bastion point, there is great difficulty in weathering it.

**Landing** on the open beach is very difficult and often impossible. Boats usually land on the eastern side on a small beach protected by some rocks which extend to the south-westward; the place is marked by a conspicuous tree.

**Supplies.**—A few fowls, eggs, &c. may be obtained here, and water-cress may be gathered by the mountain streams, which abound, but water can only be procured with great difficulty.

**The coast.**—Proceeding along the northern coast to the westward, there is Hana-hepu, then the small wooded bay Jaone, and farther on the inhabited bay Naa-o-he, where there is anchorage for small vessels and good landing on a sandy beach, so long as the wind is not northward of E.N.E. Then come Motuua and Sha-nahe or Hanaki bays; the latter affords good anchorage for small steam-vessels in about 14 fathoms in the entrance, and shoals gradually towards the shore; the narrowness of the entrance makes it difficult of access to sailing vessels. This bay may be recognised by the iron-wood trees which cover the western cape. Landing is generally easy on the sandy beach at the head of the bay.

Westward of Hanaki is the large open bight Hana-paa-owa, where there is neither landing nor anchorage. There is a church and a few huts among the trees.

Westward of this bight, the coast trends northward and north-westward for about 2 miles to cape Matau, the northernmost point of the island. Beyond this point, the general trend of the coast is East and West.

**Rock.**—About 5 cables N. by E. from cape Matau is an isolated double-headed rock, just awash, on which the sea always breaks; there is plenty of water between the rock and the shore.

**Hana-te-kua** is a small bay just westward of cape Matau. Coming from the westward, the church in the middle of the beach is a good mark. Fatu-huku island bears N.  $\frac{3}{4}$  E. 15 miles from the eastern point of the bay.

The anchorage is in  $6\frac{1}{2}$  fathoms, midway between the two sides of the bay.

Boats can land without difficulty on the western part of the beach, near a small stream of excellent water.

**Hana-iapa\*** affords good anchorage, with sufficient shelter during N.E. winds, and the holding-ground is good. Good marks for distinguishing this bay are Borne island, 49 feet high, about  $1\frac{1}{2}$  cables off the western point of the bay; and a fine cascade, about one mile westward of the bay, which can be seen from seaward at a distance of 10 miles. The anchorage is in 10 or 11 fathoms, with the eastern point of the bay in line with Fatu-huku. Boats land on the eastern end of the beach, behind a little point of rocks, around which, and at a distance of about 100 yards, there is a line of breakers which must be left on the port hand going in.

**Supplies.**—Cattle and sheep are delivered on board by the natives at this bay at moderate prices. A fine stream of water flows into the bay close to the landing place, but it can only be procured for ship's use with great difficulty.

**Directions.**—The current generally sets westward, and the wind dies away at the entrance of the bay, giving place to the land breeze. Sailing vessels, therefore, entering this bay, should keep well to windward and run in with the wind free, passing about a cable from the eastern point. The passage between Borne island and the western point, in quitting the bay, is dangerous for sailing vessels.

**Coast.**—For about 7 miles, until the next anchorage is reached, the coast is broken by several little bays, on the shores of which houses will be seen; there is no communication by land between these bays, as they are separated from each other by rugged barren rocky ridges.

**Hana-menu\*** is near the north-western point of Hiva-*oa*. The Grosse tour, a cliff of dark rocks, like an enormous tower, 735 feet high, at the end of a mountain ridge jutting out from the head of the bay, divides it into two bays. The principal bay is that on the eastern side of the Grosse tour; it was much used by whalers, and may be recognised, even at night, by the Grosse tour.

Sailing vessels can make this anchorage without difficulty, for the sea breeze draws round the eastern point of the bay. When putting to sea, take advantage of the land breeze, or kedge out. With the wind from S.E. to East the sea is smooth; with a N.E. wind the swell is felt in the bay, but the sea is rarely heavy. The land breeze ordinarily makes at about 7 p.m. and subsides at daylight.

---

\* See chart, No. 1,640, with plans of Hana-iapa and of Hana-menu.



**Anchorage.**—The best anchorage is in the eastern bay, in 11 fathoms, with the western point of the bay a little open of the Grosse tour cliff. Landing is easy at the head of the bay and there is an abundance of good water.

**Coast.**—From Bonnard point, the western point of Hana-menu, the western coast of Hiva-oo, high, rugged, and except in a few little bays, inaccessible, curves away to the southward and south-eastward for about 12 miles to Teahoa point, the south-eastern point of the island, immediately round which point is a deep bight named Vi-pi-hai, or Traitor's bay.

In the north-western part of the bay is the small rocky island Hanake, about 120 feet high and steep-to. Westward of this island, the bay is exposed to the prevailing wind and sea, and anchoring is impossible near the shore; landing is always very difficult, if not impossible.

**Taa-hu-ku bay\*** is eastward of Hanake island, and is not easy to make out if coming from the eastward, the island appearing as part of the mainland. An excellent mark for its recognition is a steep grassy slope on the western side of the head of the bay, with several houses and buildings forming a fortified position on the summit. In 1883, the fort contained four brass howitzers, and was manned by an officer and 35 men.

The extreme of Teahoa point in line with the eastern extreme of Tau-ata island leads nearly up to the entrance. Having left the island about 300 yards on the port hand, the entrance will be seen ahead, the western entrance point being black, and the eastern a low flat point. The fort above mentioned, and a road which runs along the western side of the bay are equally good guides.

**Anchorage.**—The bay is well sheltered, and there is good anchorage for vessels of medium size over an area about  $4\frac{1}{2}$  cables long by from 2 to  $1\frac{1}{2}$  cables wide; a large vessel could haul in and moor in all security. The holding-ground is good. The sea breezes are never felt, but the swell is sometimes disagreeable. With the wind from S.E. to East, the sea breaking on the western side of the bay is thrown back against the eastern side, the backlash producing a chopping unpleasant sea.

The usual anchorage is in the middle of the bay in 5 or 6 fathoms. Sailing vessels should skirt the eastern point at a distance of about 40 yards, and their headway will thus generally carry them up to the anchorage. Land breezes, blowing from North to N.E., generally prevail during the night; they attain their greatest strength about daybreak and die away between 8 and 9 hrs. a.m. Sailing vessels going out should profit by this circumstance.

---

\* See plan of Taa-hu-ku bay, on chart, No. 1,640.

Those not wishing to enter the bay can anchor southward of the entrance, in 17 fathoms, muddy sand, about one mile eastward of Hanake island, with the following bearings:—North point of Motane S.E. by E.  $\frac{1}{2}$  E.; East point of Tau-ata S.  $\frac{1}{2}$  E.

**Landing places.**—Access to the beach at the head of the bay is often difficult, but there are landing places on each side of the bay and the footpaths leading down to them can be seen from the anchorage; the best place is on the eastern side.

**Supplies.**—A stream of water on the western side affords abundance of good water during the rainy season. The village of Atuona is just westward of this bay; it is one of the largest in the island, and, from it, live stock, fruit, &c. can be obtained as well as or better than at any other anchorage.

**Current.**—The current generally sets westward along the southern coast of Hiva-*oa*, but in Vi-pi-hai bay it follows the trend of the coast and sets towards Teachoa point. After rain, its strength is considerably increased, owing to the numerous streams which fall into the bay.

**Coast.**—Between Taa-hu-ku bay and cape Balguerie there is no good anchorage, the coast generally consisting of perpendicular cliffs of considerable height.

**FATU-HUKU**,  $15\frac{1}{2}$  miles North of Hiva-*oa*, was discovered by Cook in 1774, and was by him named Hood island, after a midshipman of the *Resolution*, afterwards Lord Hood, who was the first to see it. The island is 1,180 feet high, of but small extent, and consists of a single high rock, flat at the summit, and with a gentle slope from North to South. See view on chart.

The island is barren and uninhabited; the natives of neighbouring islands state that landing is impossible, but, though it has not been attempted, there is a place on the southern side where it would appear that under favourable circumstances a landing might be effected. Fish are abundant around the coast, and native canoes from other islands occasionally resort here for fishing purposes.

**Rocks and shoals.**—D'Urville reported a rock on which the sea generally breaks about one mile N.N.W. from Fatu-huku; another bank is said to exist north-eastward of the East point of the island. The French vessel *Infernet* saw discoloured water in this neighbourhood and also the swell evidently almost breaking. At one mile eastward of the island, the same vessel had soundings of 6 and 7 fathoms.

**UA-PU**, or Adams island, is about  $8\frac{1}{2}$  miles long N.N.W. and S.S.E. with an extreme width of 7 miles; it contained in 1880 a population of about 430. The island is high, bold, rocky, and picturesque in the extreme.

---

See chart, No. 1,640.

The summits of many of the mountains take the form of conspicuous columns, spires, and pinnacles, the highest point being 4,042 feet above the sea level. In the south-eastern part of the island is a remarkable table mountain, topped on each side by a lofty spire. On the southern side are several detached islets of volcanic rock, of which the two largest are named from their respective forms, Obelisk or Sugar-loaf, and Flat island. Off the north-eastern point are two barren islets, with a dangerous boat passage inside them. Northward of these islets, at a distance of from  $1\frac{1}{2}$  to 2 miles, the depth is from 17 to 23 fathoms, sand. The whole of the eastern side being exposed to wind and sea, affords no anchorage; the western side abounds in villages, and has several convenient anchorages.

Near the North point is the little flat islet Motaukuii, between which and the shore the current sets westward with considerable strength; this vicinity should therefore be avoided.

Westward of the islet, the general direction of the coast is S.W. by W., at first broken by two unequal bights, separated by a massive point of rocks, with sand beaches at their heads.

**Aneau bay** is the easternmost of the bights above mentioned, the entrance to which is wide, but divided into two by the red-coloured Tauna rock on which the sea always breaks. When using the eastern or weather pass, care should be taken to keep close to the eastern shore, half a cable from which there are not less than  $6\frac{1}{2}$  fathoms. In 1876, the French despatch vessel *Vaudreuil* found 4 and 5 fathoms in the middle of the eastern pass, and  $6\frac{1}{2}$  fathoms immediately after passing the rock.

The western pass is much wider and deeper, about 11 fathoms everywhere, and is preferable for steam-vessels.

**Anchorage.**—In the inner part of the bay, with winds between S.E. and E.N.E., the sea is smooth, but the swell enters more or less. This anchorage is not recommended, and unless compelled to do so, large vessels would do well not to pass the night in it. Anchorage may be obtained in the eastern part of the bay in  $6\frac{1}{2}$  fathoms, but a better berth is S.S.W. of the rock in the pass; here the swell may be heavier, but there is more room for swinging, and it is easier to get out under sail.

Landing may generally be effected without difficulty in the north-eastern part of the bay.

**Hakahe-tau.\***—This port or bay lies on the northern side of the island, next westward of Aneau bay and directly under the western peak; it affords fairly good anchorage with winds from North-east, through East, to South. Approaching from the eastward, the cocoanut trees around the huts, the red rocks on the eastern side, Reddish islet in the bay, and the

---

\* See plan of Hakahe-tau, on chart, No. 1,640.

hut on the western point of the bay are good marks for its recognition. Farther eastward is a red cliff with a cavern.

Landing is easy at a natural rocky mole, at the mouth of a small river.

**Vaieo bay**,\* a bight in the western extreme of the island, is wide, but not deep. With the usual easterly winds, there is perfect shelter and good anchorage in 11 fathoms, but it is untenable with westerly winds.

The best anchorage for large vessels is with the following bearings:—North point of bay, N.W.  $\frac{1}{4}$  W.; middle of the N.E. bight, about N.N.E.  $\frac{3}{4}$  E.; and the Sugar-loaf, at the southern point of the bay, S.  $\frac{1}{2}$  E. easterly. Small craft can go farther in to the north-eastward and anchor in 8 or 9 fathoms.

In the southern part of this bay is Hakaotu bight, where small craft find temporary shelter.

**Coast.**—From Vaieo bay, the coast trends south-eastward for about 5 miles, past the bights Hakamui, Apateki, and Hikeu, in which vessels may find temporary anchorage in fine weather. It is generally calm, with occasional squalls, along the whole western coast, so that sailing vessels find some difficulty in reaching their intended anchorages.

**Akatau**, or Bay of Friends, near the southern point of the island, affords fairly good anchorage; but there are often heavy gusts from the South-east, and always a somewhat heavy swell. To the southward is the Obelisk, the remarkable sugar-loaf rock before mentioned. The anchorage is in the second bight northward of this rock; it may be recognised by the native huts, and a small chapel in the southern part of the bight.

At this point of the island the wind is generally South, blowing on shore; sailing vessels should, therefore, anchor abreast of the bight half way between the two rocky points, so as to be able to leave at any time. Steam-vessels can go farther into the bay.

Landing may be effected on the rocks to the right of the shingle beach, but with some difficulty.

**Coast.**—The weather side of the island trends northward for about 5 miles to the N.E. point, passing in succession the bays Hohoi, Paumea, and Hakamui, fully exposed to the trade wind, without anchorage, and where the landing is very difficult.

**Hakahau bay.**—From the N.E. point, the coast of Ua-pu trends W.N.W. for about 4 miles. The second bight from the point is Hakahau bay, where the Roman Catholic missionaries have their principal establishment. The anchorage is bad (coral bottom) and should only be

\* See chart, No. 1,640, with plan of Vaieo bay.

used in case of absolute necessity. Landing may be effected on a sand beach in the south-eastern part, but generally with difficulty on account of the surf.

From the offing, neither the native huts nor the mission buildings are visible, being concealed by the trees. When communicating with the shore, vessels should heave-to well to windward, as the current sets strongly to the westward.

**UA-HUKA**, or Washington island, is  $7\frac{1}{2}$  miles long East and West, about 5 miles wide, and lies about 23 miles E.  $\frac{1}{2}$  N. from Nukuhiva, the largest island of the north-western group. In 1880, it had a population numbering about 260. On the southern side are the two bights, Vaitake and Hannay bays, in which anchorage may be obtained, the best being Hannay bay. The western side appears the most fertile and at the south-western end is Shavay bay; see view on chart.

Outside the anchorages, and all round the island, there are said to be depths of from 22 to 25 fathoms at distances varying between 5 cables and 2 miles from the shore.

Off the northern coast are several small detached rocks.

**Shavay bay.**\*—Off the south-western point of the island is Hemeni or Height island, conical in shape, 318 feet high, and about  $1\frac{1}{2}$  miles in circumference, with a small detached islet off its western end; inside it is Téuaua or Hat islet, a smaller island; both are much frequented by sea birds. Northward of these islands is Shavay bay, an anchorage affording shelter with winds from North, through East, to S.E. Vessels are protected from the swell by the islands, and the depth is from 11 to 16 fathoms.

**Anchorage** may be obtained anywhere between Hemeni island and a sand beach on Ua-Huka, but do not anchor eastward of the meridian of Hemeni, as the bottom in that part is said to be rocky and uneven. The only inconvenience of this anchorage is that it is nearly 3 miles from Vaitake bay, the nearest inhabited part.

**Vaitake**, or Invisible bay, the easternmost of the two bights on the southern side of the island, is very appropriately named, for not until right opposite the entrance can it be recognised as a bay or the sandy beach at its head be seen.

A short distance eastward of the two islands which form the protection to Shavay bay anchorage is a black cape about 300 feet high, which, at a distance, has the appearance of a wedge inclined towards the land. A little farther eastward, between two black cliffs, is the narrow entrance to Vaitake bay, which lies in a N.N.W. and S.S.E. direction.

---

\* See chart, No. 1,640, with plan of Shavay bay.

At the entrance, where the depth is 17 fathoms, there is always a heavy, choppy sea. Only small craft can use the bay, for although deep, there is no room for swinging, and as the land breeze is by no means regular it is often difficult for a sailing vessel to get to sea. With winds from North to East, the sea is perfectly calm inside; but with it southward of E.S.E. the surf sets in and the place becomes dangerous.

At the head of the bay is a beach, with cocoanut trees, and the houses of the few Europeans who have settled here. In the eastern part is a small river, at the mouth of which landing may easily be effected in fine weather.

**Coast.**—A little eastward of Vaitake is a small uninhabited bay, in front of which is a large flat rock resembling a breakwater; then comes a large bluff with a reddish horizontal band across it at two thirds of its height. All this part of the coast is rugged, and studded with rocks and islets; among the latter is Motu-papa, a red islet, the sides of which are perpendicular and the upper part a plane inclined towards the land.

**Hannay bay\*** may be known by Motu Haané, a sugar-loaf islet 508 feet high, on the eastern side of the entrance; this islet cannot be mistaken on account of the dark reddish violet colour of the rocks.

The bay recedes about 7 cables from the island, and its width varies from  $3\frac{1}{2}$  cables in the entrance to  $1\frac{1}{2}$  cables near the land. The anchorage for a large vessel is in about 15 fathoms, with Motu Haané bearing East; smaller vessels with steam power may safely run well up the bay, at the head of which are a few houses and a good stream of water, with a beach of sand and gravel, on which, however, landing is almost always difficult on account of the surf.

This bay is connected with other inhabited parts of the island, and especially with Vaitake bay by a road plainly visible from the offing.

**NUKUHIVA** or Marchand island, the principal island of the Marquesas archipelago, is 14 miles in length East and West and 10 miles wide. The principal places of resort and the best anchorages are to be found on its southern coast; one of which, Tai-o-haé, is the port of call for the mail schooners running between San Francisco and Tahiti.

It is mountainous, the highest peak in the north-western part rising 3,890 feet above the level of the sea, whilst two others are between 2,000 and 3,000 feet in height, these lofty rugged rocks being very steep towards the sea, and from them numerous cascades are precipitated; amongst which, one at the southern end of the island is particularly remarkable. The bed of this waterfall appears to be several yards wide,

---

\* See plan of Hannay bay, on chart, No. 1,640.

and the water is precipitated from a rock over 2,000 feet high. This cascade is the source of the river, which empties itself into port Tai-oa, described at page 163.

On the southern side are three harbours, where ships may lie in perfect safety, viz., Comptroller bay, Tai-o-haé or Anna Maria bay, and port Tai-oa. Between the two latter are two bights or bays, which, however, do not afford anchorage, being full of rocks and exposed to the wind. This southern coast has, within one mile of the shore, depths of from 35 to 50 fathoms, over a fine sandy bottom.

**Produce.**—Nukuhiva offers great natural opportunities for cultivation, for the valleys are broad, well-watered, and possess rich soil; tropical fruits abound as in the other islands, but vegetables are scarce for want of labour and industry. From the same cause, the guava is reported to be fast over-running the land and destroying the bread-fruit and many other valuable trees.

In 1864-65, small-pox raged here with great virulence, and carried off all but a few hundreds of the natives; in the Happa and Taipi valleys, where the population numbered nearly 2,000, only about 150 were left.

The total number of inhabitants in Nukuhiva in 1880 was estimated at 800.

**Cape Martin**, or Tikapo, is the south-eastern point of Nukuhiva, and is very abrupt, being capped by masses of rock in the form of a tower, which, when seen from the south-westward, appears to incline towards the sea. The cape is steep-to, as is also Te-oho-te-kea or Sail rock, 12 feet high, which lies 3 cables South of the cape, and may be taken for a boat under sail, when standing out against the sky. Between the rock and the cape the depth is from 23 to 32 fathoms.

**Comptroller bay**,\* immediately westward of cape Martin, is about 2 miles across, and divided at the head into three coves, each of which trends in a N.N.W. direction. Vessels generally anchor in these coves, as outside of them the swell is heavy and the depth from 26 to 30 fathoms.

Huuni is the eastern cove; it is 3 cables wide in the entrance, the sea is usually calm, and landing easy on the sand. The anchorage is well within the entrance in from 9 to 12 fathoms, midway between the shores.

Hanga-haa, the middle cove, runs in more than 2 miles, and the best anchorage is in about 14 fathoms a little northward of the bluff point which separates it from the next bight to the westward, where the width is about 5 cables.

Haka-paa, the western cove, is divided into two at the head; in the northernmost, a small vessel may anchor; the anchorage for a large vessel is just abreast of the bluff point before mentioned in about 17 to 20 fathoms.

Sailing vessels find some difficulty in reaching either of these anchorages, at times, on account of the wind falling, though as a rule the wind in the

---

\* See plan of Comptroller bay, on chart, No. 1,640.

interior of the bay blows in the same direction as that outside, but inclining more to the south-eastward at the entrance of the two western coves. In the early morning, a land breeze generally blows out of each cove.

**Water** of good quality may be obtained in each cove from the stream flowing into its head.

The current near Sail rock, and at the entrance to the bay, is somewhat variable, sometimes running to the eastward, but it generally follows the direction of the trade wind.

**TAI-O-HAË**,\* or Anna Maria bay, is about 5 miles westward of Comptroller bay and may be known by the islands one on each side of the entrance and  $7\frac{1}{2}$  cables apart, most appropriately named the East and West Sentinel. The bay recedes  $1\frac{1}{2}$  miles northward from the entrance, and in the narrowest part is upwards of 5 cables wide, forming a fine basin without a detached danger of any sort, and with depths of 27 fathoms in the entrance decreasing to 6 and 7 fathoms at  $2\frac{1}{2}$  cables from the head. During the season of north-easterly winds, *i.e.*, from October to March, the swell is hardly ever felt in the bay, but during the remainder of the year there is sometimes a good deal of swell in the bay and surf on the shore.

On the north-eastern shore of the bay is the village and settlement of Hakapehi, with Fort Collet, in ruins, occupying a small green hilly headland on which is the Government flagstaff; the French authority being represented here by a Resident and a harbour-master, who also acts as a pilot. A short distance northward of this headland is a small pier 100 yards long, at the head of which boats can generally land.

**Harbour light.**—A small *fixed white* light, visible about 3 miles, is shown from the position of the flagstaff on the remains of Fort Collet.

**Directions.**—If it can be seen on approaching, as it usually can, that the breeze is blowing into the bay, a sailing vessel should enter at once. Care is necessary both on entering and leaving not to approach the western shore too closely, as an easterly wind and pretty strong westerly current render the lee shore dangerous. With a steady fresh breeze in the bay the entrance is perfectly safe, but with a light and unsteady wind, such as frequently prevails, owing to the lofty surrounding mountains, no reliance must be placed on these unsettled breezes, which veer in one moment from East to West, now coming in violent gusts and immediately after falling dead calm.

For a steamer the navigation of the bay presents no difficulty.

**Anchorage.**—The eastern side of the bay has a decided advantage over the western side for anchoring, the current not affecting the ship to the same degree, and the cables consequently being less liable to foul.

---

\* See plan of Tai-o-haë bay, on chart, No. 1,640.



All vessels should moor, with the swivel on, however short their stay, for, if at single anchor, the sudden puffs and shifts of wind, especially frequent during the night, are almost sure to cause a foul anchor and the ship to drag.

**Supplies.**—Good beef, vegetables, and bread can be obtained, but at high prices. Water can be obtained near the mole, but there is no coal.

**Tide and Current.**—It is high water, full and change, at 3h. 50m.; rise of tide  $4\frac{1}{4}$  ft. There is generally a current depending much upon the strength of the wind outside; striking the western side of the bay, it sets northward up the bay, then across the head from West to East, and then southward down the eastern side.

**Coast.**—For about 5 miles westward of Taï-o-haé, the coast is rocky and broken by several bays, none of which afford any shelter; the largest, that of Ua-uka, being very exposed; a beautifully fertile valley extends north-eastward from it into the interior of the island; immediately westward of this bay is the port next described.

**Port Tai-oa.\***—At the entrance of this bay, the western side of which is formed by lofty and perpendicular rocks, there are 20 fathoms water over a fine bottom of sand and clay. On the eastern side of the entrance is the long rocky point and slight indentation on the whole of which the sea breaks heavily, and which divides this bay from the exposed bay of Ua-uka just now mentioned.

After passing the western extreme of this long rocky point, the fine basin of Hakatea cove opens out, trending in a north-easterly direction about 5 cables and 2 cables wide; at the head is a sandy beach, behind which is a green flat. This basin is so completely landlocked that storms would scarcely affect the water, and a ship in need of repairs would find it convenient for such a purpose; the depth is from  $4\frac{1}{2}$  to 7 and 8 fathoms. The western cove is named Hakau and is shallow; an abundant stream of water flows into its head, as described at page 161, from which water may be procured at and above half tide.

There is a small village in each cove.

Bananas, cocoanuts, and bread-fruit are abundant, but animal provisions are scarce.

**Coast.**—The western or leeward coast of Nukuhiva is named Henua Ataha, or desert land, and instead of being steep and abrupt, slopes gradually up to the mountains. The natives come here to fish, but there is no harbour.

A sailing vessel should avoid this coast, where calms, caused by the high lands, extend 2 or 3 miles off-shore.

---

\* See plan of port Tai-oa, on chart, No. 1,640.

The eastern coast of the island trends northward from cape Martin 9 miles to Atupa-atua, or Adam and Eve point, and for one-third of the distance it is an almost perpendicular cliff. Atupa-atua is the north-eastern point of the island; on the extreme point and at two-thirds of its height are two singular rocks, which, seen in some positions, look like grotesque statues of a man and woman, hence the name. By the British and Americans, they are generally called Jack and Jane.

The current runs with great strength round this point.

The bay of Aa-tua-tua is a deep bight in the eastern end of the island immediately southward of cape Atupa-atua; as it lies open and exposed to the ordinary wind and to the full force of the sea, it need scarcely be said that it should be carefully avoided, and landing in it never attempted.

The North coast trends generally East and West for 13 miles, and is indented by several bays, some of which are deep, but from October to April, the season of north-easterly winds, which veer to the northward, there is a heavy sea in most of them.

**Hataivea**, a large but exposed bay where the natives sometimes beach their boats, is the first westward of Atupa-atua point. Off the western entrance point is Motu-iti or Poiku, a pointed rock, generally swarming with sea birds, which also marks the entrance to Anaho, the next bay.

**ANAHO BAY\*** is a good anchorage where vessels do not generally roll. The bay recedes about  $1\frac{3}{4}$  miles in a southerly direction, and the head on the western side is fringed by coral reef which dries in patches at low water.

With winds from S.E. to E.N.E. the sea is calm, but when from N.E. the surf begins to be felt. Sailing vessels have no difficulty either in entering or leaving the bay, and formerly it was much resorted to by whalers.

The head of the bay is only separated by a narrow isthmus from that of Aa-tua-tua on the eastern coast.

**Anchorage.—Depths.**—The depth of water in the bay decreases gradually from 25 or 26 fathoms in the entrance to 7 or 8 fathoms at  $1\frac{1}{2}$  cables from the head. Therefore, in case of need, an anchor may be let go almost anywhere. The best anchorage for sailing vessels is on the eastern side, opposite the Blow Hole, in 15 fathoms. Steam-vessels anchor in about 10 fathoms near the western anchor marked on the chart, on account of being nearer the landing place. They should not go any farther to the westward, but should keep the entrance of the bay well open.

Landing can be effected without difficulty on the beach by passing

---

\* See plan of Anaho bay, on chart, No. 1,640.

through an opening in the reef opposite some huts on the shore, as the water is always smooth there.

**Caution.**—When leaving the bay, sailing vessels should be prepared for a strong westerly current. When sailing from an anchorage taken up too far to the eastward, they may find a difficulty in weathering Mésange point, notwithstanding the E.S.E. squalls coming over the isthmus from Aa-tua-tua.

**Atiheu bay.**—The eastern extreme of this bay, the third bay westward from Atupa-atua point, is about 5 miles from that point, and may be recognised by a bluff of brown rocks, over which towers a peak 980 feet high. The bluff itself is 246 feet high, and vessels can go close alongside as there are 16 fathoms at the foot. The western side of the bay terminates in a comparatively low point.

Coming from the northward or westward the residence of the Roman Catholic missionary will be seen at the entrance of Atiheu bay, a white house on comparatively low ground.

**Anchorage.**—Proceed about one mile into the bay, which recedes nearly  $1\frac{1}{2}$  miles from the eastern point, up to which the water is deep. In many places, opposite points projecting from the eastern side, the bottom is rocky for some distance from the shore. The best anchorage is opposite a small bight in the south-eastern part of the bay in 12 fathoms, sand, with the West point of the bay bearing N.W.  $\frac{1}{2}$  W. and the eastern point North.

Violent squalls from S.E. sometimes blow from the steep mountains in the inner part of the bay. During the season of the N.E. winds, the sea is sometimes very heavy and nearly always rough. At any time it is difficult to beat out on account of the variableness of the squalls.

Landing on the beach in the N.E. season is difficult; if not impossible; but, with proper care, it may generally be effected on the rocks in the south-eastern part of the bay opposite the anchorage.

**Haume bay** is a slight indentation of the coast just westward of Atiheu, and is not inhabited. Landing is at all times difficult on the gravel beach.

**Hakapa bay** is an almost semi-circular indentation about  $7\frac{1}{2}$  miles westward of Atupa-atua point, and exposed to all winds from E.N.E., through North to N.W., without anchorage, and, at the best of times, very difficult landing on account of the large rocky boulders lining the shore, on which the sea breaks. The corresponding valley is densely wooded, and the native huts may be seen among the trees half way up the hill at the foot of very steep mountains.

**Hapapani and Vaekao bays.**—Westward of Hakapa is a bight in which are these two very small bays, Hapapani lying N.W. and S.E.,

and Vaekao N.N.E. and S.S.W. Several vessels have anchored in the former during the season of S.E. winds. These bays are directly overlocked by the highest peak of the island, only 2 miles distant to the southward.

**Hakaehau bay.**—From Vaekao, instead of a continuation of abrupt cliffs, the land descends in gentle slopes towards the sea, the beginning of the desert portion of the island. Westward of the second point from Vaekao is Hakaehau bay, inhabited by the Pua tribe. It is difficult to distinguish, but the eastern part of the highest mountain in the island bearing S.E. leads to the entrance.

The eastern point of the bay is a promontory of black rocks, which sailing vessels should pass close to when coming to an anchor.

Hakaehau is a small basin about 4 cables long and  $2\frac{1}{2}$  cables wide, lying in a N.W. and S.E. direction, and well sheltered from ordinary winds. While the *Chasseur* was at this anchorage, there was a good breeze blowing from E.N.E. and a heavy sea outside, but it was quite calm in the bay. The only winds to be feared are those from N.W.

**The depth** in the middle of the bay is  $8\frac{1}{2}$  fathoms, gray sand, gradually increasing to seaward. One mile northward of the eastern point are 22 to 26 fathoms, gray sand; so that sailing vessels can kedge out and make sail. The land breezes from E.S.E. to S.E. are, however, generally felt in the morning, and should be taken advantage of to get to sea.

Formerly a good many whalers visited Hakaehau, but they generally anchored at the entrance of the bay.

**Motu-hi** is a small bay about one mile westward of Hakaehau; it does not afford anchorage.

**MOTU ITI** or Hergest rock, 24 miles W. by N. from the N.W. point of Nukuhiva, is a volcanic rock rising 720 feet above the sea; with the exception of a little verdure on its lee side it is entirely barren, and it is quite inaccessible. Eastward of it are two other islets, almost connected with each other by rocks awash, devoid of vegetation, and much lower than Hergest rock; they swarm with sea birds, are covered with a deposit of guano, and appear quite white when seen in the distance; see view on chart.

**Soundings.**—These rocks are surrounded by a bank of muddy sand and coral on which as little as 15 or 20 fathoms is found 2 miles from the rocks. Almost touching the western side of the large rock there are 6 or 8 fathoms. At the eastern extreme they are prolonged for a short distance by rocks under water.

Landing is impossible on the large rock at any time, and nearly so on the others. There is an abundance of excellent fish around them, and native craft come from a long distance for the fishing.

**LAWSON BANK.**—Mr. Lawson, master and owner of the trading sloop *Peep-o'-Day*, reported that on May 2nd, 1863, he passed over a bank of considerable extent on which he hove to and obtained soundings of 8, 10, and 12 fathoms; also caught several large fish of the rock-cod species. On first seeing the bottom, Hergest rocks bore E. by N. about 10 or 12 miles.

In 1870 an American whaler crossed the bank, and a report to that effect appeared in a Sandwich island newspaper.

In March 1871, Captain Turner, of the schooner *Nautilus*, passed over this bank, obtaining soundings of from 4 to 10 fathoms, Hergest rocks bearing E.N.E. 7 or 8 miles.

**CLARK BANK** was first reported in lat.  $8^{\circ} 18' S.$ , long.  $139^{\circ} 52' W.$  The French war vessel *Venus* sounded near this position, and failed to obtain bottom at 176 fathoms. This bank, however, has been clearly seen from several ships, and Captain Turner, of the whaler *Spartan*, crossed it from North to South in 1855, obtaining  $8\frac{1}{2}$  fathoms least depth of water, for 2 or 3 miles, though apparently shoaler patches were seen from aloft.

From observations taken from the French schooner *Eugenie*, 1886, Clark bank is considered to be about 4 miles long North and South by 3 miles East and West, and to lie, approximately, in lat.  $8^{\circ} 18' S.$ , long.  $139^{\circ} 40' W.$ ; the letters PD are still retained on the Admiralty charts.

**EIAO** or Masse island, N.W.  $\frac{1}{2}$  N. 56 miles from Nukuhiva, *see* view on chart, is  $6\frac{1}{2}$  miles in length N.E. and S.W., and attains a height of 2,000 feet. The southern shores are rocky, without any coves or landing places; the surface, though green, produces no trees, but a few shrubs and bushes are thinly scattered over the face of the rocks. The north-western side has a more favourable aspect, and although the coast is rocky, a number of trees grow both on the sides of the hills and in the valleys. It also possesses some coves where landing is possible, especially in one near the middle; this, from the appearance of the northern side, is named Battery cove.

A little northward of Battery cove, at the north-western extreme of the island, is Vaituha or Coconut bay, which was examined by Lieutenant Hergest, who found good anchorage with regular soundings of from 5 to 18 fathoms, fine clear sand.

An excellent stream of fresh water discharges into the bay, near a grove of coconut trees. The landing is on a sandy beach at the head of the bay, and, though generally good, is sometimes indifferent on account of the surf. Water is easily obtained.

In these two valleys the vegetation seems more luxuriant than in other parts of the island. Besides these, between the peaks are several plateaux covered with pine trees and verdure. The island is not inhabited, but is occasionally visited from Nukuhiva and Ua-pu; it appears to have good pasture, and a considerable head of cattle might easily be maintained on it.

**HATUTU**, or Chanal island, 3 miles N.E. by E. from Eiao island, is about 4 miles in length N.E. by E. and S.W. by W. and one mile wide; it attains a height of 1,380 feet. At the northern point is a high pinnacle rock a short distance from the shore; and at the south-western end, rocks extend a short distance. The island has a stunted vegetation in parts, but there is no anchorage anywhere around its shores.

The channel separating Hatutu from Eiao is believed to be quite free from danger, but a breaker was once reported to have been seen in mid-channel; though the passage has been frequently passed through since, no sign of danger has been perceived, but a rock is still marked in this position on the Admiralty chart.

The current is generally running with some strength north-westward through this channel.

Hatutu affords an abundance of fish and sea fowl, and is occasionally resorted to by the natives of Nukuhiva and Ua-pu.

**CORAL ISLANDS.**—About 9 miles E. by N.  $\frac{1}{2}$  N. from the eastern end of Hatutu is the westernmost of two small coral islands; these islands are only from 6 to 9 feet above water and are surrounded by a shoal on which the sea breaks heavily. Soundings of from 12 to 20 fathoms extend a long way to the north-westward of the shoal; it is a vicinity to be avoided, as there are vague reports from whalers of other shoals in the neighbourhood; see view on chart, No. 1,640.

#### SCATTERED ISLANDS NEAR THE EQUATOR, COMMONLY CALLED THE LINE ISLANDS.\*

**FLINT ISLAND**† (British), discovered in 1801, lies in lat.  $11^{\circ} 26' S.$ , long.  $151^{\circ} 48' W.$ , is 13 feet high, covered with brushwood and trees, and is visible from the masthead from a distance of 16 miles. It

See chart, No. 1,640.

\* See Admiralty charts:—Pacific ocean, General, No. 2,683. Pacific ocean, S.E., sheet No. 783. Pacific ocean, N.E., sheet No. 782.

† See plan on sheet of plans, No. 979.

is about  $2\frac{1}{2}$  miles long N.N.W. and S.S.E., half a mile wide, and is fringed by a steep coral reef which dries at low water, and extends seaward generally about half a cable, but off the northern end of the island it extends seaward  $4\frac{1}{2}$  cables and off the southern end E.S.E.  $2\frac{1}{2}$  cables. In the interior are two small lagoons of brackish water.

The island was formerly leased to Messrs. Houlder, of London, when guano was shipped in some quantity. In October 1880 it was uninhabited, and the buoys formerly in use were gone. It was next leased to Mr. John Arundel for 21 years from the 29th November 1885, for the cultivation of the cocoanut; and eventually a company having been formed, called the Pacific Islands Company, Limited, the lease was transferred to the company.

There is little or no rise and fall of tide at Flint island. The landing is very bad even for surf boats, but it is said to export nearly 200 tons of copra annually.

**VOSTOK ISLAND\*** (British) was discovered by Bellingshausen in 1820, and lies about 86 miles N.N.W.  $\frac{1}{2}$  W. from Flint island, in lat.  $10^{\circ} 6' S.$ , long.  $152^{\circ} 23' W.$ ; it is somewhat triangular in shape and about one third of a mile in diameter. This low sandy island is thickly wooded, about 80 feet in height to the tops of the trees, surrounded by a narrow fringing reef, with heavy breakers, and is visible from the masthead from a distance of about 16 miles.

Landing may be effected on the western side, through a boat passage in the reef, where there are some huts, but in 1884 it was uninhabited.

**CAROLINE ISLAND\*** is an atoll about 123 miles E. by N. from Vostok island. It consists of a number of small islands, standing on a coral reef surrounding a lagoon, the whole being  $7\frac{1}{2}$  miles long North and South, by  $1\frac{1}{4}$  miles wide, and convex towards the East. The islets are said to be no less than 40 in number; they were taken possession of by Commander E. Nares, H.M.S. *Reindeer*, on behalf of Great Britain, on 9th July 1868, and having been leased to Mr. John Arundel, of London, on the same terms and date and for the same purposes as Flint island, are now similarly in possession of the Pacific Islands Company, Limited, as lessees.

The island or group of islets thus formed is from 15 to 20 feet high, and may be seen from the masthead from a distance of about 14 miles. The enclosing reef fringes the shore, and on the outer edge the sea breaks with considerable violence.

The reef is reported to extend one mile from the south-eastern point.

The only pass through or over the reef is near the south-western point it is deep enough to permit ships' boats to enter the lagoon at high water.

---

\* See plans of Vostok and of Caroline islands on sheet of plans, No. 979.

Caroline island was visited in May 1883 by the U.S.S. *Hartford*, for the purpose of observing the total eclipse of the sun. The transit pier used on the occasion is near the northern point of South island, and is crowned with a marble slab bearing the following inscription:—"U.S. Solar Eclipse Party, May 6th, 1883." The position of the pier is in lat.  $10^{\circ} 0' 1''$  S., long.  $150^{\circ} 14' 30''$  W.

In 1884, a few Tahitian natives were engaged in the planting and care of cocoanut trees, during the prior lease to Messrs. Houlder. They resided on South island.

**Directions.**—Pass south-westward or to leeward of the atoll, and sight the flagstaff standing among the trees, near the transit pier. The flagstaff may be easily distinguished, and in the daytime a British ensign will probably be hoisted as the vessel nears the land. When the flagstaff bears S.E. by E., if the vessel stands close to the reef, which is bold, the boat landing may be distinguished near the fluke of an anchor, just inside the surf on the reef.

The passage is formed by an indentation in the reef, about 50 feet deep, into which the boat must be pulled on the back of a roller. A sheer to port should be given to the boat when within the indentation to avoid some projecting coral rocks on the starboard hand; when this is passed a landing may be made on the flat coral reef. The reef does not dry at low water.

**Supplies.**—Several varieties of birds abound, curlew, plover, &c., and a few fowls. Fish are abundant and in great variety.

The source of fresh water is the rains, which filter through the sand and collect on the coral rock. There are two shallow wells on the southern and one on the northern island.

**Climate.**—The climate, though warm, is pleasant, and the temperature equable. The weather, though mostly fine, is changeable, occasional sudden showers occurring, generally at night or early in the morning.

**Winds.**—The prevailing winds in April and May are from the northward and eastward. In 1878, a cyclone passed over the island destroying most of the cocoanut palms.

**Tides.**—It is high water, full and change, at 4 hrs.; springs rise 1 ft. 7 in.; neaps, 5 inches. The lagoon is open to windward, and the rise and fall within is much affected by wind and swell.

**TONGAREVA or PENRHYN ISLAND,\*** also locally known as Mangorungoro, is supposed to have been seen from the ship *Lady Penrhyn* in 1788, was formally taken possession of on behalf of Her Britannic Majesty on 22nd March, 1888, by Captain Sir W.

\* See plan of Tongareva and of West Pass anchorage, on sheet of plans, No. 979.



Wiseman, Bart., H.M.S. *Caroline*, and was recently visited, September 1899, by Commander Tupper, H.M.S. *Pylades*.

The atoll, situated about 325 miles W.  $\frac{1}{2}$  N. from Vostok island, consists of numerous low islets, about 50 feet high to the tops of the trees, connected by reefs surrounding a lagoon. The whole is about 12 miles long and 7 miles wide. All the islets are covered with cocoanut trees, many, however, without heads, which might indicate that a cyclone has swept over the islands; there is, however, no record of any such visitation, and the natives state that disease in the trees causes the heads to fall off.

**Flying Venus reef.**—On 6th September 1889, the barque *Flying Venus* was wrecked on a sunken reef off the north-eastern part of Tongareva atoll, in lat., approximately,  $8^{\circ} 56' 20''$  S., long.  $157^{\circ} 53' 45''$  W.

In 1896, Lieut. W. Nunn, H.M.S. *Goldfinch*, was informed that the reef is about 3 miles N.E. from the North pass; the natives, divers, &c., all stating that there are no other outlying dangers. In September 1899 the officers of H.M.S. *Pylades* anchored on the reef, found a depth of 3 fathoms, though there is probably less, and fixed the position of the centre, from which the fishing huts on the northern part of the island bear W. by S.  $\frac{1}{2}$  S. 5 miles.

**Anchorage.**—There is a bank extending from the north-western point, about  $1\frac{1}{2}$  miles north-westward, with from 7 to 9 fathoms, and shoaler water may exist; anchorage might be obtained on this bank if necessary, but in a very exposed position.

There is fair anchorage outside the lagoon, just southward of the West pass; the bank slopes gradually from the reef to a depth of 10 fathoms and then drops almost suddenly into deep water. The wind being nearly always from the eastward, a vessel swings outwards, but it is said there is swinging room with a westerly wind, although the swell would then make the anchorage hazardous. The anchor should be dropped on obtaining soundings of from 7 to 10 fathoms.

H.M.S. *Hyacinth*, during a stay of six days, twice drove off the bank to sea at this anchorage in 1893, and in the same year Lieut.-Commanding E. Bain, H.M.S. *Ringdove*, reported that with the anchor let go in 6 fathoms, the observation spot bearing E. by N.  $\frac{1}{2}$  N., length of cable out not mentioned, there were 11 fathoms over the bows, 21 fathoms at the gangway, and no bottom with 25 fathoms over the stern.

**Passes.**—There are three passes into the lagoon, the best is the West pass, in lat.  $9^{\circ} 0' 0''$  S., long.  $158^{\circ} 3' 25''$  W., near the settlement.

The West pass is a break in the reef about 6 cables southward of Matunga or Molokai islet. There is a rock in the middle with only 9 feet over it, between which and the southern side is a passage 45 yards wide,

---

See plan of Tongareva and of West Pass anchorage, on sheet of plans, No. 979.

with a depth of 17 feet, but it is considered safe for nothing over 14 feet draught, and then only at slack water, as the tide runs at a rate of 3 or 4 knots in this pass.

The N.W. pass is northward of Matunga island opening out over the north-western bank, before described; it is reported to have a least depth of 22 feet, but this is doubtful, and it is very narrow and crooked.

The N.E. pass is about 7 miles eastward of the N.W. extreme of the atoll, and at the northern end of Tetautua, the eastern islet; it has a depth of 14 feet, but the tides run 5 knots through it. It is used by small craft trading with the settlement on Tetautua islet,  $1\frac{1}{4}$  miles southward of the pass, who generally enter by this pass but leave by the N.W. pass.

The lagoon is studded with coral heads, distinctly visible, and there is room to navigate and anchor amongst them. Off Tetautua, within the lagoon, there is a patch of sand on which the trading schooners anchor in from 9 to 15 feet. The best shelter for vessels of any size from the prevailing trade wind is at the western anchorage already described, outside the lagoon.

**Population.**—When visited by H.M.S. *Ringdove* in 1893, Messrs. Wilson and Murdoch, traders, were the only white men resident. The native population numbered at least 500, of whom about 250 reside at Omoko village, less than one mile southward of the West pass, the remainder being divided chiefly between Tetautua village on the eastern-most islet and Tepuka on the south-eastern islet. When visited by H.M.S. *Pylades* in 1899, there were a few more white traders, but the total native population was given as 417. They appear to have come from different islands, their cast of features being very varied. They are reported to be of bold and resolute character, good sailors, and expert divers; they have Protestant missionaries among them and profess Christianity.

Unfortunately leprosy exists at Penrhyn island, and the islet Matunga, just northward of the West pass, is used as a sanatorium (a *Molokai* as the natives term it) for those suffering from this disease; they are kept strictly isolated, but are visited occasionally by a boat from Omoko. Surgeon *Andrews*, H.M.S. *Ringdove*, visited this islet, found from 15 to 20 lepers on it. Staff-Surgeon *Oxford*, of the *Pylades*, also visited it in September 1899 and found the number of patients had increased to 29, all suffering from the tubercular form of the disease, and several in an advanced stage.

The natives in many cases own and sail their own trading schooners. The principal occupation of the islanders is the collection of pearl shell and cocoanut culture. Fish and cocoanuts can be obtained in abundance. About 30 tons of copra and from 35 to 45 tons of shell are exported annually; the imports being about 2,000*l.* worth of general merchandise.

The same date of the Calendar as that in the Australian Colonies is observed.

**Tides.**—It is high water, full and change, about 6 hrs.; rise,  $1\frac{3}{4}$  feet.

**MANAHIKI**,\* or Humphrey island, 190 miles S.W. by W. from Penrhyn island, its northern point in lat.  $10^{\circ} 20\frac{1}{2}'$  S., long.  $161^{\circ} 14'$  W., was discovered by Captain Patrickson in the *Good Hope*, in 1822. The British protectorate was declared and the flag hoisted by Commander A. C. Clarke, H.M.S. *Espiègle*, on the 9th of August 1889. It was last visited by H.M.S. *Pylades* in the autumn of 1899.

It is an atoll of roughly triangular shape, with its apex to the North; and its south-western angle very much rounded; it is 6 miles in length N.W. and S.E., by 5 miles at its greatest width, low, with a shallow soil, but densely covered with cocoanut trees which reach to a height of from 60 to 70 feet, and render it visible from a vessel's deck at a distance of 12 miles. Other trees common to most of these islands do not flourish here.

The population in 1899 numbered 580, nearly equally divided between two villages, their food consists chiefly of cocoanuts and fish. Great pains are taken to renew the cocoanut trees by replanting; each family has a certain number allotted to them, and even the lagoon is partitioned out in the same way for fishing.

The chief is styled King Apolo, and, assisted by a missionary and council, governs fairly well. The people are well-conducted and have two native teachers among them, sent from the mission at Rarotonga; many of the natives speak and write English. The principal village is on the western side of the atoll, and is fairly clean, neat, well built, and paved with coral; there is also a church and school-house. The king exercises authority over the neighbouring island of Rakahanga.

There is no safe anchorage at any time. The *Pylades* took up a temporary anchorage in 13 fathoms about 7 cables off the principal village, but had to send a boat in first to find a possible spot; here there would scarcely be room to swing, should the wind fall light, or from any cause the vessel tail inshore. There is no pass into the lagoon, even for boats; but there is fair landing for a whale-boat opposite the centre of the village, except from January to March, when westerly winds and unsettled weather prevail. Pearl shell is found here and appears to improve both in quantity and quality.

**Seismic wave.**—On the 17th February 1899, a tidal, or more correctly a seismic wave was experienced at this island, at Rakahanga, and at many others, doing much damage, many villages being washed away. At Manahiki it is said to have been seen approaching, having the appearance of a black wall of water.

**RAKAHANGA**,† or Reirson island, was discovered by Bellingshausen in 1820, who called it Grand Duke Alexander island. Reirson was

\* See plan of Manahiki; scale,  $m = 1$  inch, on chart, No. 979. Also anchorage, No. 979.

† See plan of Rakahanga, on sheet of plans, No. 979.

the name given by Captain Patrickson in 1822. The British protectorate was declared and the flag hoisted by Commander A. C. Clarke, H.M.S. *Espiègle*, on the 9th of August 1889. It was last visited by H.M.S. *Pylades* in the autumn of 1899.

It lies about 20 miles N.N.W. of Manahiki, and is similar to it, in appearance, but about half the size; it has a village church and school on the south-western side, with native teachers; the natives number about 370, and appear to be very prosperous. They have a bank, the only one in these islands, managed on co-operative principles and it has proved a great success. The soil generally is poor and shallow. The seismic wave before referred to was also experienced at this island.

Landing is not very good, but can generally be effected either in a native boat or in a whale boat, with the assistance of the natives, who wade out into the surf and guide the boat through a narrow and winding fissure in the reef, about one third of a mile northward of the village. No pearl shell is found here, though its introduction has been frequently attempted.

The position of the church at the south-western point of the island is lat.  $10^{\circ} 2' S.$ , long.  $161^{\circ} 5' 30'' W.$

The missionary vessel of the London Mission pays periodical visits to this, as well as to many of the islands, where they have teachers established.

**SUVÁROV or SUWARROW ISLANDS\*** were discovered in 1814 by Lieutenant Lazarev in the *Suvarov*; they were examined in 1881 by Commander Parezt of the French war vessel *Hussard*, and were finally declared under the protectorate of Great Britain on the 22nd of April 1889. They were visited by Commander Tupper, H.M.S. *Pylades*, on Sept. 30, 1899, the vessel remaining outside under way.

On the 10th August 1892, they were leased by the High Commissioner for the Western Pacific for 21 years for general purposes to Mr. John Ewart, and are now in the hands of the Pacific Islands Company, of which Mr. Nagel is at present the manager, and he has in the company's employ between 20 and 30 natives.

The group consists of several wooded islets on an atoll enclosing a lagoon, most of the islets being on the northern half. There is a good pass into the lagoon on the north-eastern side; Anchorage island, about 80 acres in extent, is at the western side of this entrance, and on it are the stores and buildings of the company, and all the inhabitants, who are employed as pearl divers and in the culture of cocoanuts, many thousands of which have been planted, and some are bearing fruit, but the output of copra is at present very small.

The atoll is of irregular shape, but is about 8 miles long North and South, and also 8 miles wide; the reef is raised but very little above water, and is dangerous of approach on the southern or south-eastern side unless the weather is clear. The northern part projects in a sharp point,

\* See plan of Suvarov island, on sheet of plans, No. 1,176.

on the eastern side of which are some islets covered with brushwood; Turtle island, the northernmost, is  $2\frac{1}{2}$  miles N.W. by N, of Anchorage island.

**The pass** into the lagoon is on the N.E. side of the reef, just eastward of Anchorage island, which, with its lighthouse, 51 feet high, forms an excellent sea-mark, the tops of the trees being 82 feet above the sea level. It should be approached from seaward by keeping the light tower between the bearings S. by W. and S.S.E. A shoal of broken coral patches, some of which are awash, projects westward from the southern or inner point of the eastern reef, having  $3\frac{3}{4}$  fathoms over its western extreme; but the reef extends very little distance from Anchorage island. The pass and anchorage inside is constantly used by the s.s. *Emu* drawing 15 feet water.

**Beacons.**—The south-eastern extreme of Anchorage island reef is marked by a white beacon, surmounted by a triangle. A white beacon also marks the N.W. point of the south-western inner patch, awash, and lying a short distance S.E. of the island. Beacons are also placed on a central coral patch, awash, and there is a direct channel into the lagoon between these two patches, with  $3\frac{3}{4}$  fathoms water. The best passage to the anchorage off the western side of Anchorage island is between the two first-named white beacons. Too much reliance must not, however, be placed on any beacon being in position.

The lighthouse is in lat.  $13^{\circ} 13' S.$ , long.  $163^{\circ} 9' 15'' W.$  No light is shown unless a vessel is expected.

**Directions.**—By the aid of the chart, there is no difficulty in entering the lagoon. When entering, steer S.  $\frac{3}{4}$  E. for the white beacon on the south-western coral patch, awash, inside; maintaining sufficient speed to stem the tide if ebbing, when it runs about 3 knots. Keep in mid-channel, and when abreast of the white beacon on the South extreme of Anchorage island reef, turn sharp to starboard and pass between this reef and the white beacon patch to the south-eastward, keeping for preference within 60 or 70 yards of the latter. Pass round the southern end of the island and anchor in about 16 fathoms midway between its western side and a sunken patch lying  $3\frac{1}{2}$  cables off but south-eastward of a line formed by two beacons on the shore south-eastward of the landing piers, or the vessel will not have swinging room.

If the central channel is used, a good look-out must be kept for a sunken reef lying a short distance to the southward of the inner end of the eastern reef of that channel; but in any case it would be advisable to send a boat ahead, and if necessary buoy the channel, for, as before stated, too much reliance must not be placed on beacons being in position.

The lagoon is full of shoals and sunken reefs.

**Tides.**—It is high water, full and change, at 6h. Om.; the rise is about 3 feet.

**DANGER ISLANDS.\***—The group consists of three islands, named Puka Puka, Motukoe, and Motukavata, with several smaller islets and sand cays, on and within an atoll  $7\frac{1}{2}$  miles long East and West, by  $4\frac{1}{2}$  miles wide at its eastern end, but much narrower and without islets at its western end. The atoll lies about 210 miles N.W. by W. from Suvarov islands and 390 miles N.E. by E. from Apia harbour, Samoa. It was discovered by Commodore Byron, H.M.S. *Dolphin*, on the 21st of June 1765, and by him named the Danger islands. They were formally annexed to Great Britain in 1892, by Captain H. W. S. Gibson, H.M.S. *Curaçoa*, and since then were visited by H.M.S. *Ringdove* in 1898, and by Commander Tupper, H.M.S. *Pylades*, in September, 1899 †.

Puka Puka, the northern island, 80 feet high and covered with cocoanut trees, is at the north-eastern corner of the atoll and is the only one permanently inhabited, containing in 1899 a population of 409 souls, the chief, Bilato, with the aid of a missionary, maintaining good order, and the people having a general well-to-do appearance. Motukavata attains a height of 125 feet, and is long and low, rising in a lump near its southern end; Motukoe is wooded, and about 100 feet high; there is a small cay at the northern end of it resembling a canoe under sail.

The reef generally is extremely dangerous, both on account of its extent, and of the strong current that sets westward on it. The lagoon is shallow with many dry patches and has no entrance even for canoes; there is deep water, close to, on the outside. The only landing place (and that generally an impossible one for ships' boats) is on the western side of Puka Puka.

No hurricanes have been known to occur here. The soil is good and the products are limes; bananas, watercress, taro, and cocoanuts; about 60 tons of copra are exported annually. Fresh water might be obtained from Puka Puka for small vessels, by using native canoes, of which there are plenty, as well as two cargo boats. Fowls, ducks, and wild pigeons may also be obtained.

The north-eastern point of Puka Puka was ascertained by observations taken by H.M. Surveying vessel *Alert* in 1880, to be in lat.  $10^{\circ} 53' S$ , long.  $165^{\circ} 45\frac{1}{2}' W$ .

**TEMA REEF**, 27 miles N.N.W.  $\frac{1}{4}$  W. from Nassau island, and about 14 miles S.E. by E. from Danger islands, is 2 or 3 cables in diameter and breaks heavily, but has no rocks showing above water. At 5 cables north-eastward of Tema reef, no soundings with 500 fathoms of line could be obtained, and all round the reef at a distance of one mile, 100 fathoms of line failed to find bottom.

\* See chart, No. 780. Also plan of Danger islands on sheet of plans, No. 1,022.

† Lieut. A. Truscott, H.M.S. *Pylades*, reports the plan to be inaccurate, neither angles nor compass bearings when hove to off the islands, being in agreement with it. Relatively with Puka Puka, the other islands appear to lie farther to the north-westward than as shown, and the bay in the reef westward of Puka Puka to be deeper and more pronounced.—Ed.

**NASSAU ISLAND**,\* also visited by H.M.S. *Pylades* in September 1899, was discovered in 1835 by an American whaler of that name, 45 miles S.E. of the Danger islands; it is 7 cables in extent East and West by 5 cables wide, and is surrounded by a fringing reef, outside of which no dangers can be seen. The island was annexed to Great Britain at the same time and by the same officer as were the Danger islands.

The northern point is in lat.  $11^{\circ} 33' 20''$  S., long.  $165^{\circ} 25'$  W.

The island has good soil, and might produce many more cocoanut, banana, and other trees than at present; its highest part is at least 70 feet above the sea. The few inhabitants depend on the visits of trading schooners for provisions; but they have plenty of good water. Bread-fruit, banana, tara, cocoanut, and lime trees all grow on this island.

The best landing place is on the northern side of the north-western point, but even with a smooth sea, a boat from H.M. Surveying-vessel *Alert* was unable to effect a landing, the swell was so great, though Commander Tupper, in 1899, thinks he could have accomplished it in a ship's whaler had a surf boat not been available.

A sounding of 975 fathoms, sand and coral, was obtained  $1\frac{1}{4}$  miles N.N.E. of this island.

In 1899, the inhabitants consisted of only half a dozen natives, who collect and ship copra for Mr. H. T. Moors, the lessee of the island.

**VICTORIA ISLAND**, the existence of which is very doubtful, is placed on the charts in lat.  $6^{\circ} 45'$  S., long.  $160^{\circ} 42'$  W. No record of the original report of its discovery can be found. On February 3rd, 1899, Mr. Flood, supercargo of the s.s. *Emu*, wrote as follows: "On our voyage from Manahiki, this island was right in our track, but in passing over its position at 8 hours a.m. on 23rd January, we could see no sign of it."

The harbour-master at Honolulu stated, many years ago, that an island, said to be in lat.  $6^{\circ} 35'$  S., long.  $160^{\circ} 45'$  W., does not exist. Probably he referred to Victoria island, but the authority for his statement of its non-existence is not known.†

**STARBUCK ISLAND**,‡ discovered by Byron in 1825, and taken possession of, on behalf of Her Britannic Majesty, by Commander Swinburne, H.M.S. *Mutine*, December 1866, is about 235 miles N.N.E. of Tongareva, better known as Penrhyn island; it is  $5\frac{1}{2}$  miles long East and West, 2 miles broad, and about 15 feet high; it consists for the most part of white coral sand covered with green tangle and ice weed, with a few shrubs on the north-eastern part, which render it visible from the masthead from a distance of about 11 miles.

\* See chart No. 780; and plan on sheet of plans, No. 1,022.

† List of reported dangers in South Pacific Ocean, Washington, U.S.A., 1879.

‡ See plan of Starbuck island on sheet of plans, No. 979.

E 8698.

M

Near the western point of the island is a large pyramid-shaped wooden beacon, which is almost the first object seen from seaward.

Starbuck is surrounded by a reef extending 5 cables from the shore, except off the eastern end where it extends farther. The northern and north-western points are the only places where landing can be effected; here there are passages through the reef, but landing is difficult and dangerous at all times.

The island has, at various times, been worked for guano, then abandoned, and in 1888 it was uninhabited; houses, pier, and a cargo boat left behind looked irreparable, but in 1899 it again appears to be leased to the Pacific Islands Company for the purpose of working guano.

Near the north-western point, close to the shore, the depth is 15 fathoms, and 85 yards farther out, the descent is from 15 to 130 fathoms and upwards; anchorage off the southern side is wholly impracticable.

The western point is in lat.  $5^{\circ} 37' S.$ , long.  $155^{\circ} 56' W.$ , as determined by the officers of the French transport *Euryale*, which vessel was lost on the island on the night of March 10th, 1870.

**Current.**—On the occasion of the loss of the *Euryale*, above mentioned, the current was stated to have set 50 miles W. by N.  $\frac{1}{2}$  N. in 24 hours. The approach to Starbuck and also to Malden island, especially from the eastward, should be made with great caution, owing to the prevalence of this current, as well as to the fact of a large portion of the reef being awash, and to the dangerous prolongation of the reefs of both islands in an easterly direction.

**MALDEN ISLAND\*** (British) was discovered by Lord Byron, Captain of H.M.S. *Blonde*, in 1825, and named after one of the officers of that vessel. It has been for many years leased to Messrs. Grice, Summer & Co., who are working the guano.

It lies about 106 miles N.N.E. of Starbuck island, is a low coral island of triangular form with apex to the westward, about 5 miles long, and 4 miles broad at the eastern end, and in no place more than 30 feet above the sea; a few shrubs and marine plants grow on the island, which render it visible from the masthead from a distance of about 15 miles. No fresh water is to be found, though repeated attempts have been made to obtain it by sinking wells.

The settlement is at the western end of the island, and a water-condensing apparatus is maintained for its supply. About 8 or 10 Europeans and a hundred natives are usually employed at the guano works. A tramway brings the guano from distant parts of the island to windward; the trucks are pushed up by hand in the morning and sail back as they are loaded. Houses, stores, carpenters' and blacksmiths' shops, tram-pier, boats, &c., are maintained in good order.

---

\* See plan of Malden island, on sheet of plans, No. 979.



There are several salt lagoons on the island, one of large size, the waters of which ebb and flow with the ocean tide. Indications of former inhabitants exist.

Communication is maintained with the adjacent islands, also with New Zealand, bi-monthly, by means of schooners of about 350 tons.

The flagstaff near the western end of the island is in lat.  $4^{\circ} 3' S.$ , long.  $155^{\circ} 1' W.$

**Climate—Rainfall.**—The climate of Malden island, as shown by a register kept from March 1890 to March 1894, is remarkably equable. The mean height of the barometer for that period was  $29\cdot864$ , and the extreme range only  $0\cdot3$  of an inch. The average maximum day temperature was  $91\cdot75$ ; only once did it reach  $99^{\circ}$ , and it was never less than  $89^{\circ}$ ; the average daily range being about  $14\cdot3$ . The rainfall averaged  $8\cdot33$  inches per annum, falling on 53 days, but it differs considerably in different years, viz.; from  $5\cdot73$  inches falling on 48 days in 1890, to  $11\cdot74$  inches, on 63 days, in 1892.

**Winds.**—Gales and fogs appear to be equally unknown, and the trade wind blows with great steadiness, as shown by the following table:—

General Direction of Wind from March 1890 to March 1894.

—	North.	N.E.	East.	S.E.	South.	S.W.	West.	N.W.
	Days.	Days.	Days.	Days.	Day.	Day.	Days.	Days.
Number of days or parts of days on which the wind blew from point indicated	38	205	1,138	51	1	0	3	5

**Anchorage.**—The island is steep-to, with but an indifferent anchorage on the lee or western side; a boat pier extends under sheers, from which cargo boats are loaded.

Moorings are laid down off the western side of the island in deep water, about 80 to 100 fathoms, and although close to the beach are considered secure and allow swinging room. The utmost caution is necessary when approaching them under sail, especially as the current generally runs strongly to the southward. It is advisable to keep some after-sail set aback when at the moorings, to prevent tailing on the reef should the wind fall light, or else to drop a small stern anchor in about 60 fathoms.

No. 3 buoy has only the shore anchor; if using this buoy, an outer anchor should be dropped from the ship.

A small ledge extends a short distance from the shore just southward of the pier, on which a vessel struck on casting from the buoy and

See sheet of plans, No. 979.

became a wreck. Care is necessary in giving this ledge a wide berth, as the current sets right across it.

**Landing** is effected at the loading pier, or on the beach when the surf permits.

**Coal** in small quantities and with some difficulty can generally be obtained at Malden island.

**Current.**—A strong westerly current must be expected and taken into consideration when navigating in this vicinity. It runs very strongly between Malden and Starbuck, generally to the westward about 32 miles in 24 hours; and in the vicinity of the latter island it has been estimated to run 43, 51, and even 56 miles W.S.W. in 24 hours. But in October 1887, H.M.S. *Cormorant* had a north-easterly set of 17 miles, near Malden island, so that great care is requisite and a constant resort to astronomical observations to check a vessel's position, as it is evident that implicit reliance cannot be placed on the set being always westerly.

**FILIPPO REEF.**—The master of the Italian barque *Filippo* reports that, on the 28th June 1886, the weather being fine and clear, with a light breeze, he passed a reef which he estimated to be about one mile long N.W. and S.E., and less in width. From the appearance of the breakers on the reef, it has only 2 or 3 feet water over it. Position given, lat.  $5^{\circ} 31' S.$ , long.  $151^{\circ} 49' W.$

**JARVIS ISLAND,\*** supposed to have been discovered by Captain Brown, of the ship *Eliza Francis*, in 1821, was formally annexed to Great Britain by Commander Nichols, H.M.S. *Cormorant*, on the 3rd of June 1889.

It lies in lat.  $0^{\circ} 22\frac{1}{2}' S.$ , long.  $160^{\circ} 0' W.$ , about 365 miles N.W. by W.  $\frac{1}{2}$  W. from Malden island; it is a small coral island about  $1\frac{1}{4}$  miles in extent East and West, and  $1\frac{3}{4}$  miles North and South on its western side, but only one mile in that direction on its eastern side; it appears as a white sandy beach, 10 or 12 feet above the sea, without trees and almost without shrubs, and but few patches of grass; it may be seen from the masthead from a distance of about 14 miles. There is no anchorage.

The island has large deposits of guano, and shows unmistakable signs of having been raised by upheaval; the lagoon has disappeared and its bed is 7 or 8 feet above the sea, with many marks indicating the gradual retreat of the waters. It is now let on lease to the Pacific Islands Co. for the purpose of working the guano.

---

\* See chart No. 3,045, Enderbury to Christmas island; also plan of Jarvis island on sheet of plans, No. 979.

Landing is effected through a gap in the reef on the north-western side, where, with the wind at East, there is no difficulty in getting on shore.

A shoal bank extends about one mile from the north-eastern point of the island, on which the least water obtained was 5 fathoms. A bank also extends from the south-western point.

**CHRISTMAS ISLAND\*** was discovered by Cook in the *Resolution* on Christmas day, 1777; he remained there until January 2nd ensuing, and in this interval observed an eclipse of the sun. The island was formally taken possession of, on behalf of Her Britannic Majesty, on the 17th of March 1888, by Captain Sir W. Wiseman, H.M.S. *Caroline*.

The observation spot on the northern end of Cook island is in lat.  $1^{\circ} 57' 17''$  N., long.  $157^{\circ} 27' 45''$  W.

Christmas island is about 200 miles N.E.  $\frac{1}{2}$  N. from Jarvis island, is one of the largest of the coral islands, being 40 miles long on its northern side from East point to N.W. point, and 35 miles long on its southern side from S.E. point to S.W. point, with an average width of 35 miles. The highest parts are near the north-western and south-western points, where the height of the beach and the scrubby growth of cocoanut and other trees renders it visible 12 miles from a vessel's deck; but at the eastern end, where it is quite barren and does not exceed 3 or 4 feet in height, it is not visible more than 5 or 6 miles from a vessel's deck, the haze of the breakers being often seen before the land; this, together with the strong and uncertain currents which generally set westward and north-westward, particularly at full and change of the moon, render the eastern side of the island extremely dangerous, and many wrecks have occurred upon it.† A vessel getting embayed in the deep bight formed between East and S.E. points, at night, has but a poor chance of getting out again after discovering the breakers.

The winds are generally from the eastward, with an occasional squall from the northward or southward; rain squalls during the night are frequently experienced near the time of full moon.

**Passes.**—On the western side of the island is an indentation, with Cook island, 10 feet high, a sandy island lying in the centre, between each end of which and the shore are narrow shallow passes into the lagoon; small vessels may enter by either of them, but the lagoon itself is also very shallow and studded with coral rocks, making its navigation difficult even for boats, and the sea breaking over the low belt of coral makes anchorage inside very inconvenient.

\* See chart No. 3,045; also plans of Christmas island, on sheet of plans, No. 2,867.

† On May 4th, 1897, H.M.S. *Wild Swan*, approaching the island from the northward, found the current to be setting eastward and south-eastward fully  $1\frac{1}{2}$  knots an hour. Between 7 p.m. that evening when she sailed for Fanning island, and noon of May 5th, the vessel was set S.  $\frac{3}{4}$  W. 16 miles.—*Lieut. S. Staden, R.N.*

**Anchorage.**—There is good anchorage, quite out of the current, with the flagstaff at the settlement bearing East; north-eastern tangent of Cook island S. by E.  $\frac{1}{2}$  E.; and the two beacons, situated about 200 yards northward of the flagstaff, in line bearing E. by N.  $\frac{1}{2}$  N.

Stand in with the beacons in line, and anchor when in 12 fathoms. The flagstaff shows distinctly, but the beacons do not show well when approaching from the northward, on account of the background of bushes, until the anchorage is neared, when they become plainly visible.

There is fair anchorage between 3 and 4 cables off Cook island in from 10 to 15 fathoms, and the water is generally smooth. The tides set strongly in and out of the lagoon, but are not much felt at this anchorage.

**Landing, &c.**—The settlement, such as it is, is on the northern point of the northern pass, and the best landing is round the point inside the lagoon abreast of the houses; some care is required to keep clear of coral heads and there is often a good deal of swell in the entrance.

**Supplies.**—Fish are plentiful, of excellent quality, and easily caught by heaving a line a few feet from the beach at high water. A few turtle have been seen, and sharks are numerous, giving much trouble to the shell divers.

**Water.**—The water supply is very precarious, depending upon rainfall. An inferior quality of decidedly brackish water is found by digging shallow wells; it answers for cooking purposes, and would sustain life for a short time.

The wood of the bushes growing on the island is extremely soft, spongy, and of but little value; the cocoanut trees which Cook, Scott, and others noticed, nearly all disappeared, and though many attempts at replanting have been made, comparatively few now exist, though the export of copra is said to be again on the increase.

**Inhabitants.**—The island is under lease to Mr. J. Ewart for general purposes for 21 years from the 10th of August 1892, but is worked by Messrs. Henderson and Macfarlane, whose steamer visits it once a year to bring stores, take away the produce, and to relieve their workpeople, who only remain one year on the island, with the exception of the manager, who remains two years. In 1897, when visited by H.M.S. *Wild Swan*, this floating population consisted of one Englishman (Mr. Hawk), six native men and one native woman. The men are employed diving for pearl shell and collecting shark fins and tails.

**Tides.**—It is high water, full and change, at 4h. 23m. Springs rise 3 feet 2 inches.

---

See plans on sheet of plans, No. 2,867.

**FANNING ISLAND\*** is an atoll enclosing a large and for the most part a very shallow lagoon; it was discovered by Captain E. Fanning of the ship *Betsy*, 1798, and was formally taken possession of, on behalf of Her Britannic Majesty, on the 15th of March 1888, by Captain Sir W. Wiseman, H.M.S. *Caroline*. Since 1857, it has been, and still is, in the occupation of Mr. William Greig and his family. It lies about 145 miles N.W.  $\frac{1}{2}$  W. from Christmas island, and is thickly covered with cocoanut trees, from 60 to 90 feet high, which render it visible from a vessel's deck at a distance of about 15 miles. The observation spot on the southern side of the entrance to English harbour is in lat.  $3^{\circ} 51' 23''$  N., long.  $159^{\circ} 21' 50''$  W.

The greatest length of the atoll is  $9\frac{1}{2}$  miles, N.W. and S.E., by 4 miles wide; it is not above 2 or 3 feet high in any part, except along the outer coast-line for the greater part of its length, where a raised rim of coral has been thrown up by the sea to a height of about 10 feet in places. This rim forms a kind of breakwater on its northern and eastern sides.

On all sides, the edge of the reef is steep to at from 100 to 200 yards from the shore, the 100-fathoms line encircling the atoll at about  $2\frac{1}{2}$  cables from the shore, except on the northern and north-western sides, where it is about 5 cables from the shore, and in this part the plateau of soundings is of sufficient width to permit of anchorage in from 13 to 20 fathoms with sufficient swinging room to clear the reef.

The width of the coral belt enclosing the lagoon, almost entirely occupied by fertile islands, is nowhere more than  $7\frac{1}{2}$  cables; there are several gaps in the trees, which appear from seaward like passes into the lagoon, but are not so, the only ship entrance being English harbour on the south-western side. On the eastern and north-eastern sides are several canoe passes through the reef, but they can only be used in the finest weather.

Fanning island has been favourably reported on as a possible telegraph cable station for a submarine cable connecting British America with certain of the Pacific islands and with the Australian colonies.

**Produce.**—Guano of an inferior quality was formerly exported, vessels loading at Whaler anchorage, but the guano has either been worked out or has ceased to pay, and that settlement has been abandoned. Pearl oysters, of rather small size, are found in the lagoon, and are a source of profit. Considerable quantities of copra, but much less than in former times, are exported annually, a schooner from Honolulu, chartered by Messrs. Greig and Bicknell, calling, as a rule, twice a year both at this and at Washington island.

---

\* See chart, No. 3,045; also plan of Fanning island, No. 2,971, with English harbour, and Whaler anchorage.

**Coal and Supplies.**—About 150 tons of coal were in store in 1897, which could be obtained at about 3*l.* per ton, but it was doubtful if the stock would be renewed; a small tramway leads from the coal stores to the jetty. Of other supplies practically there are none, though the island has great capabilities if cultivated, for Mr. Greig has tilled a patch of ground in which a variety of fruit and vegetables are grown for his own use, and he has a good supply of fowls and pigs, also a few cattle.

Snipe, duck, and curlew can be shot, and land-crabs are in abundance. Fish of excellent quality abound in the lagoon and there is a good beach for hauling the seine near the settlement.

**Inhabitants.**—In 1897, including Mr. Greig and his family, the total population amounted to forty-two. It is of the same roving nature as at Christmas island, the people coming on hire and being changed every year.

**Whaler anchorage.\***—On the north-western side of Fanning island,  $3\frac{1}{2}$  miles north-westward of English harbour, and opposite a small indentation in the coast is this anchorage, in from 10 to 20 fathoms about  $2\frac{1}{2}$  cables off-shore. Abreast of the anchorage is a boat channel through the fringing reef to the beach, formerly marked by two posts, of which, however, the stumps only remain, rendering the spot rather difficult of recognition.

This anchorage is useful if waiting tide to enter English harbour, and landing can almost always be easily effected. The best berth is in 13 fathoms with the South extreme of land S.  $\frac{1}{2}$  E., the North extreme N.E.  $\frac{3}{4}$  N., and the posts at the landing place, if visible, E.S.E. The 20-fathoms line is about 60 yards outside this berth, and, from thence, the depths increase rapidly.

**English harbour.\***—The entrance to the lagoon is 280 yards wide between Danger point on the northern side and Weston point on southern side, but a reef drying in patches extends half way across the channel from Danger point, and another a short distance from Weston point, reducing the navigable width, with more than 20 feet water, to less than 100 yards. In the best water, there are from 4 to 6 fathoms.

The tides run upwards of 5 knots in the narrowest part, and, though both flood and ebb streams set straight through, vessels should not attempt the passage except at or near slack water. On the ebb, there are tide rips and overfalls extending from the spit on the northern side to near the centre of the channel, which might at times be dangerous to boats.

A bearing of Weston point is the best guide either in entering or quitting English harbour, but vessels should not enter without a pilot, who will come off from the settlement on the eastern side of Weston point, where there is a flagstaff. Though a good harbour for steamers, the prevailing

\* See plans of Whaler anchorage and English harbour, on sheet, No. 2,971.

winds make it an unsafe place for square-rigged sailing vessels to enter ; fore and aft rigged vessels, with a knowledge of the tides, may work in.

**Anchorage.**—The best and only safe anchorage for vessels of more than 13 feet draught is immediately within the entrance points off the settlement in 4 or 5 fathoms water and in the full strength of the tide ; here a vessel 250 feet long, and moored, has barely room to swing. There is an inner and spacious anchorage with 7 or 8 fathoms, where vessels might lie at single anchor ; but, to reach this anchorage, a bar 3 or 4 cables wide with only 12 to 15 feet water has to be crossed, which at present makes it an impossible anchorage for any but small craft. There is very little tide at this inner anchorage and there is no doubt that, if required, a moderate amount of dredging and blasting would convert it into an excellent harbour capable of accommodating many ships.

A steam-vessel of 16 to 18 feet draught may enter safely with the beginning or end of the ebb, and moor opposite the houses as directed. In entering, Weston point should be steered for bearing N.E. by E. ; this clears the shoal extending southward from Danger point, after passing which Weston point may be passed at a distance of 60 or 70 yards. There is a narrow eddy on the flood on the southern side just inside Weston point. If practicable, it would be well before entering to anchor a boat or place a buoy on the edge of the shoal water extending S.W.  $\frac{1}{2}$  W. 2 cables from Weston point.

The best time for leaving the anchorage is at the beginning or end of the flood tide.

With the exception of, and beyond, the inner anchorage described, the lagoon is choked with coral bars and patches, said to be growing up ; there are however some deep places. Small vessels may lie alongside the eastern shore out of the tide.

**Jetty.**—An iron jetty, formerly at Whaler anchorage, is now erected at the settlement at English harbour between Weston and Kitty points. Vessels drawing 13 feet can load alongside, but breasted off about 30 feet. H.M.S. *Penguin*, 200 feet in length and drawing 17 feet water, lay in this position, but breasted off 80 feet, for a fortnight in safety and comfort, with a brow out ; the ebb tide alone was felt, and it ran at an extreme rate of  $1\frac{1}{2}$  knots only.

**Winds and Weather.**—The N.E. and S.E. trades appear here to merge into an easterly wind, which blows during the greater part of the year, perhaps the S.E. trade is predominant ; there is rarely a calm. During January, February, and March, uncertain weather prevails and sometimes strong northerly winds, with much rain ; also north-westerly gales, when neither the anchorage nor the berth alongside the wharf would be safe for a large vessel.

**Water** may be procured by digging wells, in which the fresh water rises and falls with the tide; these wells should not be more than 4 feet deep or the water becomes brackish.

**Tides.**—It is high water, full and change, at 6h. 15m.; springs rise 2 ft. 0 in.; neaps range 6 inches. The flood stream runs for 10 min. after high water, the ebb for 20 min. after low water; the flood at from  $4\frac{1}{2}$  to 5 knots, the ebb at about  $3\frac{1}{2}$  knots, but both are much affected by the force and direction of the wind. During neaps, though the streams are not so strong, the difference is not nearly so great as might naturally be expected.

**WASHINGTON ISLAND,\*** also called New York island, lying 75 miles N.W. by W. from Fanning Island, was discovered by Captain Fanning in 1798, and was formally annexed to Great Britain by Commander Nichols, H.M.S. *Cormorant*, on the 29th of May, 1889. It is, like Fanning island, in the occupation of the firm of Greig and Bicknell.

It is  $3\frac{1}{2}$  miles in length East and West, by  $1\frac{1}{4}$  miles wide, the height above the sea about 10 feet, and with the exception of the area occupied by a fresh-water lagoon  $1\frac{1}{2}$  miles long in the eastern part of the island, it is entirely covered with a most luxuriant growth of cocoanut and other trees, which render it visible from the masthead from a distance of about 14 miles.

There are about 2,000 tons of guano on the island, but it is not worked. The soil is very rich, and all kinds of tropical fruit and vegetables flourish.

The fringing reef extends 5 cables off the eastern point, and for some distance around the north-eastern side; at the western end, two tongues of reef extend between 3 and 4 cables from the shore; in all other parts the edge of the fringing reef is close to the shore, but at the western end a bank, deepening very gradually, extends a long way to the westward, there being only 14 fathoms at  $2\frac{1}{2}$  miles from the land.

When approaching Washington island, every opportunity should be taken to verify the position of the ship, for, being near the southern edge of the counter equatorial current, great variation both in direction and strength of current may be expected.

The village is at the western end of the island. The observation spot, near the village, is approximately in lat.  $4^{\circ} 43' N.$ , long.  $160^{\circ} 25\frac{1}{2}' W.$

**Anchorage.**—The bank described, extending from the western end of the island, affords good but very exposed anchorage in any depth from 7 up to 17 fathoms. In 1897, H.M.S. *Wild Swan* when anchored here, in 10 fathoms, found it a remarkably uncomfortable anchorage, a strong westerly current setting the ship up broadside to the sea caused by the strong N.E. trade wind then blowing.†

\* See chart, No. 3,045, and plan of Washington island, on sheet of plans, No. 2,867.

† Mr. Greig stated at the time that the *Wild Swan* would have been in a much better berth nearer the shore.—*Ed.*



Landing is nearly always dangerous and sometimes impracticable on account of the heavy surf. The old landing place is at a small gap between the two spits of reef at the western end, but a new landing has been made in the reef, about half a mile eastward of the old landing place, where there is, as a rule, much better landing, but it has the disadvantage of being some distance from the anchorage.

**Inhabitants.**—In 1897, the inhabitants comprised the two Messrs. Greig, and about 70 natives, the latter all on the contract hire system, as at Fanning and Christmas islands; they are engaged in the gathering and shipping of copra, of which between 300 and 400 tons are said to be exported annually on behalf of Messrs. Greig & Co., and just previously to the arrival of the *Wild Swan*, it had taken them three weeks to load one of their small schooners, one of their large cargo boats having been smashed in doing so.

**PALMYRA ISLAND\*** is an atoll, discovered by Captain Sawle of the American ship *Palmyra* in 1802, and formally annexed to Great Britain by Commander Nichols, H.M.S. *Cormorant*, on the 28th of May, 1889. It lies about 120 miles N.W. by W.  $\frac{1}{2}$  W. from Washington island, and consists of many small islets occupying a space  $5\frac{1}{4}$  miles East and West by  $1\frac{1}{2}$  miles North and South.

The atoll encloses three distinct lagoons, each having 20 fathoms water and upwards; but without openings or passes, even for boats. The islets are low, the highest being only 6 feet above the sea, and covered with bush and cocoanut trees; the latter being from 60 to 100 feet high, render them visible from a ship's deck at from 12 to 15 miles. From a distance, the islets appear to form a group surrounding a single lagoon.

The coral reef extends  $1\frac{1}{4}$  miles eastward of Portsmouth point, the eastern extreme of the group of islets, and at its termination it is broken up into a number of detached patches. The bank, however, extends fully 3 miles E.  $\frac{1}{4}$  S. from Portsmouth point, with apparently from 4 to 6 fathoms, but the heavy blind rollers, breaking occasionally, renders it impossible to do more than define the edge of this bank, which falls down very steeply to upwards of 100 fathoms, the lead giving no warning of approach to danger. With Portsmouth point bearing W.  $\frac{1}{2}$  N. 1·6 miles, H.M.S. *Cormorant* found less than 3 fathoms.

Strong and variable currents may be expected, and should be guarded against.

There were no inhabitants when visited by H.M.S. *Penguin* in 1897; but traces of former inhabitants, who occupied Strawn island, are said to exist, and such traces were also found by the officers of H.M.S. *Penguin* on Observatory islet, the south-western islet of the group. The observation

\* See chart, No. 3,045, and plan of Palmyra island, on sheet of plans, No. 2,867.

spot, on the North point of Observatory islet, is in lat.  $5^{\circ} 52\frac{1}{4}'$  N., long.  $162^{\circ} 6'$  W.

**West bank and reefs.**—Westward of the islets, a bank nearly 2 miles wide in the centre extends westward nearly  $4\frac{1}{2}$  miles; it has a ridge with from 6 to 8 fathoms on its southern side, from 7 to 10 fathoms around its western end and northern side, and from 7 and 8 to 14 and 15 fathoms in the centre. Outside the ridge, the soundings everywhere descend with a steep gradient to depths of 100 fathoms and upwards.

The drying reef at the western end of Palmyra island is fronted for a distance of one mile by such a mass of small coral heads, some awash some with a foot over them at low water, that it is almost impossible for even a skiff to find her way amongst them. Westward of this mass of rocks, the water suddenly deepens to from 4 to 8 fathoms and offers excellent anchorage.

**Anchorage.**—It is dangerous to approach the anchorage at Palmyra island either from the northward or southward, on account of the shoal water extending nearly 2 miles westward from Sawle point on the northern side, and nearly the same distance from Palm point on the southern side. The safest approach is from the westward. The best anchorage, for a ship drawing 18 feet water or more, is in 8 fathoms, sand and coral, with Sawle point bearing N.E. by E.  $\frac{1}{2}$  E. and Palm point E.  $\frac{1}{2}$  S.

**Landing** is bad at low water on account of the innumerable coral heads. The best landing is on the northern side of Penguin spit. At high water, a skiff can just manage to float over the reef into the western lagoon.

**Wind and weather.**—Mr. Strawn, formerly a resident, stated that during the five months he had been on the island the rain was almost constant, four days of dry weather being the longest interval on any one occasion. There is no evidence that the island is visited by storms, but strong squalls sometimes blow from East and S.E. During the stay of H.M.S. *Penguin* in the latter half of May, the wind was generally from N.E. to E.S.E. light to moderate. Not much rain fell during that time, nor up to the middle of June whilst the ship was still in that vicinity.

**Supplies.**—Fish are abundant and in great variety; turtle scarce; curlew, snipe, and plover were found, and land crabs abound. On one of the eastern islets is a small pool which generally contains rain water.

**Tides.**—It is high water, full and change, at 5 h. 5 m.; springs rise 3 feet, neaps range  $1\frac{1}{4}$  feet.

**KINGMAN REEF.**—In June 1874, the British steamship *Tartar* struck on this reef, which having since been surveyed by Captain A. M. Field, R.N., H.M.S. *Penguin*, in 1897, is considered to be without doubt identical with Caldeu reef, Maria shoal, and other imaginary dangers reported from time to time in the vicinity, which, after an exhaustive search by the *Penguin*, have been removed from the charts. Kingman reef lies N.W.  $\frac{1}{2}$  N. 33 miles from Palmyra island; it is of atoll character, of triangular shape, with base to the southward and apex to the northward. Within the 100-fathoms line, it is  $9\frac{1}{2}$  miles long East and West by 5 miles North and South. It dries at low water on its north-eastern, eastern, and south-eastern edges; at the West extreme is a patch of 4 fathoms, and possibly less, on which the sea breaks occasionally. The remainder is encircled by a ridge with from 4 to 10 fathoms, within which the depths are from 14 to 45 fathoms. Outside the ridge, the bank falls suddenly to depths of 300 and 400 fathoms.

Approximate position of S.E. extreme, lat.  $6^{\circ} 23' N.$ , long.  $162^{\circ} 18\frac{1}{2}' W.$

**Current.**—Kingman reef is within the belt traversed by the counter equatorial current setting eastward, which current in this part attains a strength of from 30 to 42 miles a day.

**DIANA SHOAL** was discovered by a schooner of that name in 1852, on her passage from Honolulu to Fanning island. The position given was lat.  $8^{\circ} 40' N.$ , long.  $157^{\circ} 20' W.$ , but a depth of 2,860 fathoms has been found at this spot, and soundings in the vicinity gave depths of from 2,600 to 2,950 fathoms generally. In 1863, Captain Richards, H.M.S. *Hecate*, searched unsuccessfully for the shoal in the above position, but was informed afterwards at Fanning island, by an English trader, that it is well known to exist, and is of considerable extent. It is not shown on the Admiralty charts, but under these circumstances its existence must be considered as possible, though very doubtful; it has never again been reported, and, if existing, the position given was certainly wrong.

**BRAY ROCK**, discovered by Captain Bray of the American Mission ship *Morning Star* in 1898, is a ragged coral rock about 50 yards in extent and from 6 to 10 feet high. Its approximate position, as now placed on the chart, is lat.  $7^{\circ} 32' N.$ , long.  $173^{\circ} 13' W.$  As islands had formerly been reported in this locality by whalers, viz., one in lat.  $7^{\circ} 48' N.$ , long.  $173^{\circ} 12' W.$ , and "Four rocks" in lat.  $7^{\circ} 51' N.$ , long.  $176^{\circ} 6' W.$ , it is probable that a reef exists in the vicinity, of which Bray rock is a head above water; it is, however, shown on the Admiralty charts as "doubtful."

**REEF.**—A reef has been reported by whalers and is shown on the chart in lat.  $10^{\circ} 0' N.$ , long.  $179^{\circ} 30' W.$  Its position requires to be established, if existing; and, in the meantime, it also is marked as "doubtful."

---

See chart, No. 782.

## CHAPTER VI.

HAWAIIAN OR SANDWICH ISLANDS, INCLUDING THE CHAIN  
OF ISLANDS, ROCKS, AND SHOALS TO THE WESTWARD.

## VARIATION IN 1900.

---

Sandwich islands, Hilo bay	-	-	-	9° 20' E.
—————, Honolulu	-	-	-	9° 50' E.
Midway island	-	-	-	10° 30' E.

---

**HAWAIIAN or SANDWICH ISLANDS.\*** — The Hawaiian islands have hitherto been considered as those lying between the parallels 18° 50' and 23° 5' N. and the meridians 154° 40' and 161° 50' W., in a W.N.W. and E.S.E. direction, consisting of eight islands and some small rocky islets, having an area of about 6,000 square miles; but the chain of islands extending westward and including Kuré or Ocean island, in lat. 28° 26' N., long. 178° 30' W., is now embraced within this group, the whole being under the sovereignty of the United States since August 12th, 1898.

The principal islands were first made generally known to Europeans by the third voyage of Cook, in 1778, but it appears probable that they were previously known to the Spaniards, as in some charts, taken by Anson from a Manilla galleon, there is a group of islands called *Los Magos*, placed between lat. 18° and 22° N. and long. 135° and 139° W., the different members of which are named *La Mesa*, *La Desgraciada*, *Los Monges*, &c.

The Spanish word *Mesa*, signifying table, probably refers to Hawaii, the summit of which, unlike those of most volcanic islands, appears flat; also the position as regards latitude would seem to point to the conclusion that the group is identical with the Hawaiian archipelago.

On the 18th of January 1778, Cook sighted Kauai island, and on the 20th of January he anchored in Waimea bay, on the south-western side of the island; he named the group the Sandwich islands in honour of the Earl of Sandwich, the first Lord of the Admiralty.

After visiting the coast of North America, Cook again returned to the islands, anchoring at Kealahou bay, on the western side of Hawaii, on the 17th of January 1779.

The natives were found to be friendly and hospitable on this occasion, and on the 4th of February Cook took his departure, but during a gale on the 8th, the *Resolution* being disabled, the ships returned to Kealahou bay on the 11th.

---

\* See Admiralty charts: Pacific ocean N.E. sheet, No. 782; and Sandwich islands, No. 1,510.

On this occasion, from some unascertained cause, a chief was killed, and several petty thefts being resented, a misunderstanding speedily arose which led to a conflict with the natives, in which the distinguished navigator was killed on the 14th of February 1779.

The vessels left Kealakekua bay on the 22nd, and an examination was made of the group, the vessels leaving finally on the 15th of March 1779.

The next visitors were Captains Portlock and Dixon in the *King George* and *Queen Charlotte*; they anchored in Kealakekua bay on the 26th of May 1786, and left the group in June, but on two subsequent visits at the end of the year, and also in 1787, they called at most of the islands and were well received by the natives.

It appears that La Perouse was at the Hawaiian islands at the same time as Portlock and Dixon; he anchored at Maui island and left on the 1st of June 1786.

In 1787, Captain Meares visited the group, remaining a month, and reported very favourably on the disposition of the islanders; and in 1788 and 1789 Meares and Douglas visited the islands, the latter remaining amongst them about four months.

Between 1790 and 1795, Vancouver called in on three occasions. In 1793, he introduced cattle and sheep from California, landing them at Hawaii; he also endeavoured to bring to a close the fatal wars then continually raging between the natives of Hawaii and those of the other islands.

In 1794, Kamehameha, the chief of Hawaii, accomplished the subjugation of all the other islands, and when he died, in 1819, at the age of 66, he was king of the whole group. He was succeeded by his son Liho Liho, during whose reign the first missionaries arrived in the group, sent by a society in the United States.

In 1824, Liho Liho, in company with his wife, prime minister, and suite, visited England. Unfortunately, both he and his wife died in London, whereupon the *Blonde* frigate, under command of Lord Byron, was despatched to convey the rest of the party, with the remains of their king and queen, back to the Sandwich islands.

On the death of Liho Liho, who on succeeding to the sovereignty of the islands had taken the title of Kamehameha II., his brother, then 12 years old, was proclaimed king as Kamehameha III., under the regency of his mother; on whose death, in 1833, he assumed the entire government of the islands, Honolulu, in Oahu island, becoming the capital.

In 1843, the independence of the group as the Hawaiian Kingdom was acknowledged by Great Britain, France, and the United States; but this settlement was of short duration, for disputes as to the admission of Roman

Catholic missionaries led to a temporary occupation of the islands by the French in 1849; this matter having been adjusted, the power of the king was settled, as it was hoped, on a firm basis, a constitution promulgated, and in 1864 the integrity of the kingdom was again guaranteed by the same three governments.

The settlement of 1864 proved to be as illusory as previous attempts, for after a few comparatively peaceful years, a general state of unrest and of internal disputes and intrigues again supervened and gradually gained strength until, in 1894, a revolution abolished monarchy and declared a republic, Mr. Sanford B. Dole, an American citizen, being elected president for a term of 6 years from the 4th of July 1894; which term was shortened and the office abolished by formal annexation of the whole Hawaiian group to the United States by joint resolution of the United States Congress, dated July 8th 1898, and duly approved by President McKinley.

By virtue of this act, the republic of Hawaii became a part of the sovereignty of the United States, and on August the 12th, 1898, the Hawaiian flag was hauled down from all government buildings, and that of the United States raised in its stead.

The whole of the islands comprising the Hawaiian group proper, as well as some of the western chain, are volcanic, and are mainly due to the effects of successive eruptions from craters which have been active through long periods of time. Whether at any period any of these islands could have been classed among the atolls, so common all over the Pacific, is unknown, as they have not been very critically examined; well defined coral has, however, been found at the height of 500 feet in Molokai, and a bed of coral also exists at an elevation of 4,000 feet in Kauai; coral, interstratified with lava beds, is also reported to have been found in some of the other islands.

**EARTHQUAKES** experienced in this group are rarely severe or destructive; the heaviest occur in the district southward of Mauna Kea, in Hawaii. The seismic wave, however, the usual attendant of earthquakes originating near the sea coast, is often very destructive, sweeping away villages and causing great loss of life and property. Of the inactive craters, Puowina or Punch-bowl hill, and Leahi or Diamond hill, in Oahu, are well known from being situated near Honolulu, the capital; but the most remarkable and the largest known crater in the world is that of Mauna Haleakala, in the eastern part of Maui, 10,030 feet above the sea. (*See page 209.*)

In May, 1877, a seismic wave caused great damage among the islands; it occurred almost simultaneously over the whole group, viz., at about 4.45 a.m. The range at Hilo was estimated at 36 feet, and at Kealahou,

---

*See chart, No. 1,510.*

30 feet; while at Honolulu it was only 5 feet. The loss of life was small, but the damage to property was considerable.

In July 1896, a seismic wave, which was experienced and did great damage on the Japanese coast, was also felt in the Hawaiian group.

**THE NATIVES** of these islands are strong, active, well made, and rather above the average height of Europeans, the complexion of the upper classes being comparatively fair; the men make excellent sailors, and are largely employed in vessels trading in the Pacific.

The population shows a lamentable decrease since the first discovery of the islands. Cook estimated it at 400,000, probably at least 100,000 too high. In 1823, it was estimated at 142,050; and by the census of 1832 it was 130,315; by that of 1836, it had fallen to 108,579. In 1848, there was great mortality in the islands, measles, whooping cough and influenza sweeping off some 10,000 people. In 1884, for the first time, the census showed a slight increase, but this was owing to the large influx of the foreign element. In 1890, the total population was returned at 89,990. In 1896, it was 107,000, and its composition was as follows:—Hawaiians, 75,000; Japanese, 24,000; Chinese, 15,000; Portuguese, 9,000; whites of European and American descent, 14,000.

**SUPPLIES**, both for export and ships' use, may be obtained in great variety; all the usual tropical fruits and vegetables are indigenous, whilst a vast number of animals and plants introduced since the days of Cook have thriven well and are now abundant, though a large portion of the land formerly under cultivation has long ceased to be so.

Cattle and sheep are plentiful in all the large islands, and poultry may be obtained in any quantity, but are expensive. Sugar, coffee, rice, tapioca, wheat, maize, beans, peas, yams, taro, potatoes, oranges, limes, grapes, pineapples, pumpkins, bread-fruit, plantains, and many other fruits and vegetables flourish, and are in constant demand for vessels calling at the various ports.

**Standard Time.**—Standard mean time of the meridian of  $157^{\circ} 30' W.$ , or 10h. 30m. slow on Greenwich mean time, has been adopted for the main group of the Hawaiian islands.

Coal for steaming purposes can be obtained in large quantities at Honolulu, *see* page 228, and a small supply is sometimes available at Hilo, but cannot be depended on.

**THE CLIMATE** is equable and considered healthy for Europeans, and on the whole favourable to vegetation, whilst the soil, volcanic in its origin, is generally fertile. Neither atmospheric pressure nor temperature vary greatly. The following table, being a summary of observations taken at Honolulu, at 50 feet above the sea, in the year 1897, gives a close approximation to the average of any year and for any island in the group.

---

*See chart, No. 1,510.*

TABLE of BAROMETER and THERMOMETER AVERAGES, &amp;c. for the Year 1897 at PUNAHOU STATION, HONOLULU.

MONTH.	BAROMETER.				THERMOMETER.				No. of Days on which Rain fell.
	Average for Month.	Max.	Min.	Average Daily Range.	Average for Month.	Max.	Min.	Mean Daily Range.	
January -	30·042	30·21	29·83	·091	69·74	79	59	13·1	12
February	30·124	30·24	29·99	·080	72·23	82	62	12·3	18
March -	30·121	30·32	30·00	·081	72·47	80	63	11·2	21
April -	30·150	30·25	30·02	·078	73·70	82	64	12·0	16
May -	30·112	30·24	29·99	·065	74·29	87	63	14·0	14
June -	30·057	30·14	29·95	·049	75·10	87	64	12·1	25
July -	30·065	30·17	29·96	·067	76·83	86	68	11·4	22
August -	30·057	30·12	29·97	·055	77·43	88	68	12·8	23
September	30·024	30·10	29·93	·068	76·80	87	66	13·1	27
October -	30·033	30·14	29·91	·086	76·13	84	66	10·6	22
November	29·994	30·12	29·86	·076	72·96	83	59	13·9	13
December	30·053	30·26	29·87	·083	71·25	83	57	13·0	13
For the Year } Year	Average 30·085	Average 30·32	Average 29·83	Average ·074	Average 74°·08	Max. 88°	Min. 57°	Avg. 12°·8	Total 226

**WINDS and WEATHER.**—It is a notable fact that the force of the wind according to the Beaufort scale is very rarely registered above 6 anywhere in the Hawaiian group. The N.E. trade wind, generally blowing strongly, prevails for 8 or 9 months in the year, beginning about the early part of March, and until May blowing well from the northward. From May to October it is more easterly in direction.

The trade wind causes a very heavy sea in the channels, and during this period, for many miles to leeward of the larger islands, frequent calms and light baffling winds impede navigation between the various ports.

During October, light trades and calms occur, and sometimes a swell from W.S.W., which makes the anchorages on the lee sides of the islands disagreeable, though not unsafe.

During November and December, the trade is strong, but irregular, and sometimes interrupted by light southerly winds.

See chart, No. 1,510.



In January and February, southerly and south-westerly gales, called by the natives *Konas*, often occur, lasting from a few hours to two or three days, followed by rain; they render all the lee anchorages unsafe. The rainy season often commences as early as November and usually ends in April.

On the West coast of Hawaii, land and sea breezes are very regular.

**Rainfall.**—The amount of rainfall varies greatly in the different islands, and as might be expected in such mountainous regions, at different stations and heights in the same island, the greatest rainfall being, however, always on the windward side of an island. Each of the principal islands is divided into districts, and regular observations are taken and recorded at the various stations in each district under the regulations of the United States weather bureau.

The following table shows, for the six principal islands in the year 1897, the maximum and the minimum rainfall at any station in the different districts of each island, and also the average annual rainfall for each island computed from the reports of averages of all districts in each island:—

TABLE showing RAINFALL per annum in HAWAII GROUP, 1897.

Name of Island.	Name of District.	No. of Stations in District.	Maximum Rainfall in District.	Height of Station above the Sea.	Minimum Rainfall in District.	Height of Station above the Sea.	Average Rainfall for all Stations in each District.	Average for whole Island by Districts.
			Inches.	Feet.	Inches.	Feet.	Inches.	Inches.
Hawaii	Hilo	11	146·21	1,250	82·05	200	103·21	64·54
	Hamakua	8	62·26	400	30·68	300	42·08	
	Kohala	4	29·36	585	26·27	200	27·80	
	Kona	7	67·43	1,540	24·36	2,730	54·47	
	Kau	5	40·91	1,250	13·30	15	24·56	
	Upper Puna	3	147·34	1,650	98·93	750	129·60	
	Lower Puna	4	95·74	650	52·63	8	70·03	
Maui	Leeward	4	*79·00	300	3·81	15	27·60	55·33
	Windward	7	225·95	3,500	42·18	60	92·36	
	Central	4	39·50	1,400	17·52	180	46·57	
Molokai	Mapulihu	1	—	70	—	—	—	33·92
Lanai	Koele	1	—	1,600	—	—	—	30·46
Oahu	Honolulu	8	29·65	50	6·37	10	18·87	36·46
	Interior	4	85·12	850	50·30	250	60·88	
	Koolau	4	65·27	300	22·36	25	44·03	
	Leeward	4	48·06	1,700	13·42	60	22·06	
Kauai	Windward	2	82·65	10	55·38	325	69·00	—
	Middle	3	41·24	300	28·24	200	33·71	
	Waiawa	1	—	30	—	—	*13·00	

\* An asterisk denotes that the figures against which it is placed are approximately accurate. See chart, No. 1,51

**CURRENTS.**—The general direction of the currents in the vicinity of the Hawaiian group appears to be westward, with a rate of from one to  $1\frac{1}{2}$  knots an hour; but they are subject to much variation, both in force and direction, at different seasons, without appearing to be influenced by the winds or to follow any general law.

**Pilots** are always ready at every port to board vessels on the usual signal being made. They are frequently retired British and American masters, and consequently know how to handle a ship. Most of the ports are accessible without their assistance, others are not; strangers, therefore, are recommended to employ them.

**HAWAII**, formerly spelt Owhyhee, is the south-eastern, and by far the largest island of the group; the western coast has a general trend of S. by E.  $\frac{1}{2}$  E. for about 80 miles from Upolu point, the northern extreme, to Ka Lae, the southernmost point of the island; from thence, the south-eastern coast trends N.E. 60 miles to cape Kumukahi; and the north-eastern coast N.W. by W.  $\frac{1}{2}$  W. 75 miles from cape Kumukahi to Upolu point; in each case, prominent portions of the coast-line extend far outside the general trend as here given.

To one unacquainted with the great height of the mountains of Hawaii, the island might appear to be of comparatively small altitude, its surface rising very gradually from the sea shore, uniform and unbroken; no abrupt spurs or angular peaks are to be seen.

By reason of its great height, the climate on the weather and lee sides is very different; for, the North-east trade striking the high land causes abundance of rain to fall on the eastern side, while on the western coast, as may be seen by the preceding tables, the rainfall is very moderate and in some parts even scanty; hence, the rich hues on the eastern slopes of Hawaii, covered with verdure and vegetation, contrast strongly with the bare and arid aspect of the greater part of the western side.

Consequent on the numerous volcanic eruptions which have taken place on this island, and the lava streams that have flowed in all directions from the volcanoes, a great part of the interior is a barren desert, with but few inhabitants, and many of the once beautiful valleys have been converted into black-looking desolate tracts of cinders, mud, and lava.

**Local magnetic attraction.**—Reports received from H.M.S. *Sappho* stated that in the vicinity of Hawaii the compass of that ship was affected when near the island; on this subject, see Introductory Remarks on General Navigation under the heading of "Local Magnetic Disturbance of the Compass on board Ship."

**Mauna Kea**, 13,805 feet in height, is the highest point of Hawaii, and may be described as a vast mound, surrounded by nine cones, which

may be considered as so many craters, from which no activity has been observed for a great number of years. The sides of this mountain are clothed with vegetation to within 1,000 feet of the summit; in the winter months frosts prevail, and it is capped with snow.

**Mauna Loa** is only 130 feet lower than Mauna Kea, but of very different formation. Its summit is an active crater, which appears as an enormous flattened dome, sloping gradually down on all sides, and presenting a perfectly smooth appearance from seaward. All vegetation ceases at about 4,000 feet from the summit, and from thence to the edge of the crater extend fields of lava.

This volcano was ascended and numerous observations made by the U.S. Exploring Expedition in 1841. The crater is very extensive, and is still active; terrible eruptions have taken place at intervals of a few years and great destruction caused, both by streams of lava, earthquake, and attendant sea wave.

**Kilauea**, also an active volcano, 4,400 feet high, lies 18 miles to the eastward, on the slope of Mauna Loa. The crater is  $3\frac{1}{2}$  miles long,  $2\frac{1}{2}$  miles wide, and about 700 feet deep.

**Hualalai**, a peak 8,275 feet in height, is near the West coast of the island. On the summit is a large crater, which has not been active for some time; the last great eruption from it took place about the year 1810.

This mountain rises abruptly on its western side, but viewed from seaward it presents a magnificent slope.

**Ka Lae**, the southern point of the island, in lat.  $18^{\circ} 55\frac{1}{2}'$  N., long.  $155^{\circ} 42'$  W., is very low, and rises with a gentle slope to the hills behind.

**Kaalualu**.—From Ka Lae, the coast trends N.E.  $\frac{1}{2}$  N. 6 miles to Kaalualu, where there is a small bay and fair anchorage, formed by an old lava flow jutting out to the southward; the lava also runs out some distance into the bay, but the shallow water is easily discerned by its light green colour.

Good shelter may be obtained during the prevailing North-east trade, but with southerly winds the anchorage is much exposed. In August 1882, H.M.S. *Sappho* remained at anchor here for  $2\frac{1}{2}$  days, in 10 fathoms, white sand and lava patches, with the extreme of the point bearing E. by N. With 40 fathoms of cable, there was plenty of room to swing clear of the edge of the lava flow.

In the north-eastern corner of the bay there is a good pier for landing, but a boat has to avoid several very shallow patches of lava on which there is always a heavy swell.

There are only a few huts here, and no supplies of any sort are to be obtained.

**Honuapo** is a village about 7 miles northward of Kaalualu, where there is a large sugar mill near the beach, and a wharf. When practicable, the coasting steam-vessels call here, but the landing is very bad and often impossible.

**Punaluu** is a very exposed roadstead in the Kau district, about 4 miles north-eastward of Honuapo. There are two buoys moored in 13 and 17 fathoms which the small coasting steam-vessels make use of, and north-eastward of them anchorage may be obtained in 15 fathoms, but it is not recommended unless the weather be very fine.

**Harbour lights.**—Two small lighthouses, privately owned and only lighted when a steamer is expected, stand on the shore in line with the buoys; to the southward of them is a wharf, slightly protected by a projecting point of rock.

There is a large village inland about 6 miles N.W. of Punaluu.

**Coast.**—From Punaluu, the coast trends N.E. by E. 49 miles to cape Kumukahi, the eastern point of the island; in all this distance there are no bays, and no good anchorage, as it is entirely exposed to wind and swell.

When beating to windward against the trade wind, along this coast, keep close inshore, never standing farther off than from 20 to 25 miles, and thereby avoiding the strength of the south-westerly current, which at times runs  $1\frac{1}{2}$  knots an hour outside this distance; the shifts of wind close inshore are generally favourable. Near cape Kumukahi there is an eddy current at times, enabling a vessel to round that cape with ease.

Cape Kumukahi is low and rocky, with some tree-covered hillocks a short distance to the westward.

From cape Kumukahi, the coast trends north-westward, with a slight inward curve, for 16 miles to Leleiwi point; there are several villages near the shore, and the land is well cultivated. The coast is precipitous, and the sea always breaks against it with violence.

Leleiwi point is very low and wooded, with some scattered cocoanut trees on it.

Keokea point, the eastern extreme of Hilo bay, lies  $2\frac{1}{2}$  miles W.N.W. of Leleiwi point.

**HILO BAY**,\* also called Byron bay, on the north-eastern side of Hawaii, is the only anchorage on this coast. It is about 7 miles wide between Keokea and Alia points, and recedes 3 miles south-westward from this line.

\* See chart, No. 1,510; also plan of Hilo or Byron bay, on sheet of plans, No. 1,377.

**Blonde reef, buoy.**—This bay is fully exposed to the North-east trade wind, and would afford no anchorage, were it not for the Blonde reef, which extends from the eastern part of the bay for  $1\frac{1}{2}$  miles in a W.N.W. direction, leaving a navigable channel 6 cables wide between its western extreme and the shore. There are from  $1\frac{1}{2}$  to 5 fathoms on Blonde reef, on which the sea breaks heavily at low water when much swell is setting in. A red conical buoy with black staff and globe marks the western edge of the reef in  $4\frac{1}{2}$  fathoms.

The scene which the island presents as viewed from the anchorage in Hilo bay is both novel and splendid. The shores are studded with extensive groves of cocoanut and bread-fruit trees, interspersed with plantations of sugar-cane; through these, numerous streams are seen hurrying to the ocean; to this succeeds a belt some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise higher and higher from the sea, change their character from the vegetation of the tropics to that of polar regions; and above all tower the snow-capped summits of the mountains.

From Keokea point, the coast trends, with a curve,  $1\frac{3}{4}$  miles W.S.W. to Mbukuola or Cocoanut island, which lies off a point from which it is separated by a narrow channel only a few yards wide, and a ridge of rocks extends  $1\frac{1}{2}$  cables north-westward from it. This island has one conspicuous house and several small ones on it; when required, it is used as a quarantine station.

**A rock** with 7 feet water over it and 5 fathoms around, lies about one cable W. by S.  $\frac{1}{2}$  S. from the large house on Cocoanut island.

From Cocoanut island, the coast turns S.S.W. 4 cables to Waiakea creek and village, where landing may be effected in all weathers. The water in this creek is only fit for washing purposes. There are two piers to the northward of the entrance of the creek, alongside the northernmost of which ships drawing 15 feet can lie.

From Waiakea creek, the coast line turns to the westward as a sandy beach, for nearly one mile, to the head of the bay where the town of Hilo is built.

**Halai beacon**, on Green hill behind the town of Hilo, is triangular in form and painted white. On a S.S.W. bearing, it leads into the bay between the western end of Blonde reef and the land, but unfortunately it is no longer conspicuous, as a large tree has grown up and obscures its base.

On Aleales point,  $7\frac{1}{2}$  cables northward of the town on the western side of the bay, stands a large new sugar mill, and Turret rock, about 15 feet high at the extreme of the point, has been utilized as the foundation for

the landing, and sheds for the storage of sugar. A large camp in connection with the factory works is established just behind the mill.

**Hilo** is the principal town in Hawaii, and ranks next to Honolulu in importance and population. The town may be easily recognised from seaward by the tall, white, square towers of the Roman Catholic church, and the pointed white spire of the Protestant church; there are also several other large buildings, both public and private, such as the court-house, schools, governor's house, stores, &c.

There are several sugar plantations in the vicinity of Hilo, on which industry the town is mainly dependent for its prosperity. Besides sugar and molasses, Hilo exports hides, tallow, goat-skins, arrowroot, rice, and a small amount of coffee.

The rainfall here is very great, *see* table page 167, and accounts for the luxuriant verdure of the district; as much as 150 inches has been known to fall in one year.

Steam-vessels communicate with Hilo from Honolulu once a week, and schooners ply constantly between the two ports.

**Supplies** of nearly all descriptions can be obtained. Beef about 10 cents per lb., bread about 9 cents, and vegetables at 6 cents. There is no coal to be depended on as available.

**Landing.**—A small pier just southward of Cocoanut point and in front of the town, formerly acted as a landing place, but sand-banks have grown up around it and rendered it useless and impracticable. The only landing place is that already mentioned at Waiakea.

**Harbour Light.**—A small *fixed red* light is exhibited from the pier.

**Buoys.**—There is a mooring buoy south-westward of Cocoanut island, off the entrance of Waiakea creek. Two small buoys have been placed by the Wilder s.s. Co. in 3 fathoms north-eastward of Cocoanut point; they are used for stern lines or for warping lighters. Other small buoys south-westward of Cocoanut point are used for stern lines of sailing packets. A small buoy off the Turret rock is used by the sugar lighters.

Close westward of the town, and bordered on its southern side by Cocoanut point, is Waterfall creek, the mouth of Wailuku river, and about 2 miles from the entrance are the Rainbow waterfalls, 105 feet in height. There is a good watering place up this creek, which is generally easy of access except when the wind is blowing hard from seaward; on such occasions the surf is high, and the rocky bar at the entrance becomes dangerous for boats to pass. The water is excellent and abundant.

From Cocanut point, the coast trends northward  $7\frac{1}{2}$  miles in almost a straight line to Alia or Makahanaloa point. This coast-line is steep and bluff, about 200 feet high, and broken by deep ravines called "gulches," in which the villages are situated; these gulches are from 800 to 1,000 feet deep, and, apparently, worn by watercourses. There is no landing for boats, as all along this coast the surf beats on the rocks with great violence.

**LIGHTS.—On Paukaa Point**, about  $2\frac{1}{2}$  miles N. by W.  $\frac{1}{4}$  W. from Cocanut point, is a lighthouse resembling a red water tank on an open white frame-work tower; from it is exhibited, at 170 feet above the sea, a *fixed green* light, visible 10 miles.

**On Keawemoe**, a mile southward of Alia point, and N.  $\frac{1}{4}$  W. about 6 miles from Paukaa point light, is a white wooden frame-work tower and lantern, from which is exhibited at 65 feet above high water, a *fixed white* light, visible 10 miles.

**Anchorage.**—Hilo bay is a safe anchorage, and, next to Honolulu, may be considered the best in the Sandwich islands. In 1841, during the three months December, January, and February, when the ships of the U.S. Exploring Expedition were lying in the bay, they did not have enough wind to tauten their cables; and the residents say that the wind never reaches the force of a gale.

With a strong trade wind there is a slight sea, unpleasant enough for boats but not sufficient to endanger a ship. At times, however, a considerable swell sets in, which causes a ship to roll disagreeably. A northerly wind is felt most, but seldom blows strongly.

A well-sheltered anchorage can be picked up anywhere under the lee of Blonde reef, in from 5 to 7 fathoms, as the reef affords good protection. A vessel drawing 15 feet or less may anchor so as to be quite under the lee of Cocanut island and Keokea point.

**Pilotage.**—One licensed pilot is maintained at Hilo bay, but his services are not necessary, the anchorage being so easy of access.

**Directions.**—When making for the anchorage, as a general rule, it is best to close the land a little to the northward of Blonde reef, steering about West for the lighthouse, and then to run down alongshore about 4 cables from the land until Aleales point bears about West, when the course may be altered for the anchorage under the lee of the reef.

If Halai beacon can be made out and kept bearing S.S.W., it leads into the bay westward of Blonde reef, as does also the tower of the native church seen between the two towers of the Roman Catholic church, S.  $\frac{1}{4}$  W.

On approaching the bay from the eastward, Honolu or Cocomut cove, about 2 cables southward of Paukaa lighthouse, is a good spot to steer for, as it leads close to the entrance of the channel. The cove appears like a dark mark in the land, and there is nothing in the vicinity which resembles it.

On putting to sea in a sailing vessel, it is advisable to beat well to windward in a north-easterly direction after clearing the Blonde reef, not attempting to weather Alia point until it can be done with certainty at a distance of 5 or 6 miles, as the trade wind may not blow home to the shore, which is very steep-to, and a heavy swell and current set constantly against the precipitous cliffs.

**Tides.**—It is high water, full and change, at 1 h. p.m.; rise about 3 feet.

**The Coast** north-westward of Alia point is steep and rocky, without shelter or anchorage, and numerous cascades and streams run down the mountain sides over the cliffs into the sea. Here and there are a few small bays, or breaks in the cliffs, where the natives are able to land in their canoes on the sandy beaches.

From Alia point, the coast trends W.N.W. 33 miles to a small bay about 4 miles wide, under mount Kohala, but it is too much exposed to be used as an anchorage. Westward of this bay, off the western extreme of some black rugged cliffs, are several rocky islets a short distance from the shore; from thence to Upolu point, a distance of about 13 miles, the sea breaks heavily near the shore, and a heavy confused sea gets up, which may possibly arise from a sudden decrease in the depth, as Vancouver obtained soundings of 7 fathoms at 2 miles from the shore.

**LIGHTS.**—At Laupahuhu, 12 miles north-westward of Alia point, a small harbour light is shown near the point.

At Kauhola point, westward of Keokea harbour, and about 7 miles eastward of Upolu point, is a white wooden frame-work tower and lantern, from which is exhibited, at 60 feet above high water, a *fixed white* light visible 10 miles.

**Upolu point** is the northern extreme of Hawaii; the land behind is an extensive well-cultivated plain rising gradually to the foot of the mountains.

From Upolu point, the coast curves round quickly to the southward, and then trends S. by E.  $\frac{1}{2}$  E. 11 miles in almost a straight line to the entrance of Kawaihae bay.

**Mahukona\*** is a small village with anchorage off it, about 6 miles southward of Upolu point. The place has become of importance through

---

\* See chart, No. 1,510, also plan of Mahukona, on sheet of plans, No. 1,490.



the energy of a Mr. Wilder, who, having made a convenient landing-place, constructed a railway, 15 miles in length, to bring the sugar from the Kohala district, round the northern end of the island. The cargo boats lie alongside the pier and are laden and cleared very quickly by means of a steam "crab" which works a truck up and down the incline.

There is no water in the place, though the attempt has been made to obtain it by the sinking of an artesian well, without result; in consequence, all the fresh water used has to be brought from Kohala by train.

Anchorage may be obtained in 10 fathoms, a little southward of the outer buoy; the bottom is of coral with sandy patches; and whilst the N.E. trade wind is steady clear of the land, strong off-shore gusts blow continually at the anchorage in the day time, generally ceasing, however, at sunset; these gusts render vessels liable to drag off the bank, which is steep-to. This anchorage, therefore, is but indifferent, and, with winds to the westward of North or South, would be dangerous.

Freight is disembarked and shipped at night, during the greater part of the year.

The soil along this coast is barren for 3 or 4 miles inland, owing to the want of rain. The face of the country is regular, ascending gradually from the coast to the summit of the high land.

**Buoys.**—Five *can* buoys are moored in the roads, the two inner ones black, the three outer ones red. They are used for stern lines for vessels loading or unloading.

**Beacon.**—On the northern side of the harbour, on the first point southward of Makaohule point, is a whitewashed stone beacon about 20 feet high; it bears N. by W.  $\frac{1}{4}$  W. from the lighthouse.

**LIGHT.**—A *fixed white* light, visible 9 miles, is exhibited at 75 feet above high water from a white stone beacon 18 feet high, standing one-third of a mile southward of Mahukona anchorage.

The coast from Mahukona to Kawaihae bay appears to be clear of off-lying dangers, and no bottom was obtained with 20 fathoms of line at  $1\frac{1}{2}$  miles from the shore.

**Kawaihae bay\*** is an extensive open bay, about 8 miles wide and 4 miles deep, fully exposed to the westward. In a cocoanut grove just behind a sandy point near the centre of the bay, is Kawaihae village, consisting of a general store, two or three houses, and several huts along the shore. In front of the village is a pier for boats.

The soil of this district near the coast, though naturally rich, is badly watered, and 7 or 8 miles in the interior from Kawaihae bay, the land becomes rocky and barren.

---

\* See chart No. 1,510, also plan of Kawaihae bay, on sheet of plans, No. 1,377.

The climate is, upon the whole, unpleasant, especially at Waimea, about 9 miles eastward of Kawaihae, in consequence of an unusually strong trade wind bringing with it a mist towards sunset. This wind rushes furiously down between the mountains bounding the valley of Waimea, and becomes dangerous to shipping in the bay. It is called by the natives *mumuku*, and is foretold by them from an illuminated streak that is seen far inland and is believed to be caused by the reflection of the twilight on the mist that always accompanies the *mumuku*.

The principal exports of the district are hides, tallow, and beef.

**LIGHT.**—From a white pyramidal beacon near the shore, northward of the village, is exhibited, at 50 feet above high water, a *fixed white* light, visible 10 miles.

**Reef.**—Towards the head of the bay, a coral reef which dries in patches at low water, extends in places 6 cables from the shore, in front and southward of the village. From the N.W. extreme of the reef, the lighthouse bears N.N.E.  $\frac{1}{2}$  E. A boat passage round the northern end of the reef, close alongshore, affords easy landing.

**Anchorage.**—On approaching the anchorage, which lies northward of the reef just described, a good landmark is a conspicuous mound, a short distance southward of the village, formerly used as a place for the offering of human sacrifices to the god of war. Another conspicuous mark, about  $2\frac{1}{2}$  cables E.  $\frac{1}{2}$  S. from the lighthouse, is Macy's grave, a white tomb in the form of a pyramid.

The best anchorage is in 8 or 9 fathoms, with the lighthouse bearing East, about 4 cables. The bottom inside this depth is very uneven, there being coral heads with only  $4\frac{1}{4}$  to 5 fathoms on them, and having depths of 7 to 9 fathoms between. It is necessary to anchor immediately soundings are obtained, as the bank is steep.

A red mooring buoy, for the use of the local mail steam-vessel, is moored in  $6\frac{1}{2}$  fathoms, about 3 cables from the shore; but it is not always in position. Vessels should not anchor inside this buoy.

With strong westerly winds, Kawaihae anchorage is very exposed and most unsafe to remain at.

The sea breeze from the westward lasts all day, and the North-east trade or land breeze sometimes blows strongly all night.

**Caution.**—It is necessary to approach this anchorage with great caution, and with the lighthouse on the right bearing, as in fine calm weather the swell seldom breaks on the reef extending from the shore off the village.

**Supplies.**—Beef may be obtained at Kawaihae at 6 cents a lb., potatoes are abundant, and plenty of fish may be caught with the seine.

---

See chart, No. 1,510, also sheet of plans, No. 1,377.

The watering place is in a small sandy bay, and is only a pool of rainwater collected in a hole; 500 feet of hose is required to pump it into a boat. In the summer, the water becomes stagnant and unfit for drinking purposes; in winter, more rain falls and it then becomes a stream.

**Coast.**—From the head of Kawaihæ bay, the coast trends S.W. by S. 23 miles to Keahola point, the western extreme of the island, where it turns south-eastward for 7 miles to Kailua. Along the whole of this coast there is no shelter, and the shore-line has been much altered by lava streams flowing from the crater of Mauna Loa.

**Kailua bay\*** is a small indentation in the coast receding about 2 cables, and  $2\frac{1}{2}$  cables wide; it is exposed to the southward and westward, but affords good anchorage at most seasons of the year. At the time of the visit of the U.S. Exploring Expedition in 1841, it was the residence of the governor of Hawaii island. On a point on the western side of the bay is the tomb of King Kamehameha.

**Climate.**—Rain seldom falls on this coast, except in showers, and a rainy day once in the year is looked upon as something remarkable. This, together with the absence of all dew, prevents the existence of much cultivation; it affords, nevertheless, a coarse vegetation sufficient to pasture a few hundred goats; a mile back from the shore, the surface is covered with herbage sufficient to maintain cattle, &c.; and 2 miles in the interior there is sufficient moisture to preserve a constant verdure.

The temperature is mild and equable; during the winter the thermometer ranges from  $64^{\circ}$  to  $85^{\circ}$ , and in summer from  $68^{\circ}$  to  $86^{\circ}$ .

The prevailing winds are land and sea breezes, which are very regular; there are also occasionally strong North winds, but the strongest winds are those from South-west, which last from a few hours to two or three days, and render the anchorage unsafe.

When approaching Kailua bay, bring the summit of mount Hualalai, 8,275 feet in height, to bear N.E. by E., and steer in on that bearing; the town may be recognised by the two churches, and by the cocoanut groves on the shore to the westward.

**Harbour light.**—A small light, visible about 6 miles, is exhibited from a stand on the western side of the bay, but only when the local schooners or coasting steam-vessels are expected.

**Landing.**—On the western side of the bay is a small cove protected from the surf by some rocks, on the north-western side of which cove is a small stone pier forming a convenient landing place for boats.

---

\* See chart, No. 1,510, and plan of Kailua bay, on sheet of plans, No. 1,377.

**Coast.**—From Kailua, the coast trends in almost a straight line S. by E.  $\frac{1}{2}$  E. 5 miles to Keauhou bay, a small indentation affording indifferent anchorage and exposed to all but easterly winds, and then in the same direction  $5\frac{1}{2}$  miles farther to Kealakekua bay.

**Kealakekua bay,\*** on the western side of Hawaii, affords the best anchorage on that coast, and lies between Lava point and Neei or Cocoanut point, which are  $1\frac{3}{4}$  miles apart on a N.W.  $\frac{1}{2}$  W. and S.E.  $\frac{1}{2}$  E. line of bearing. The bay derives its name (path of the gods) from a slide in the hill, still visible.

The climate is mild throughout the district; the thermometer ranging from  $62^{\circ}$  to  $76^{\circ}$  in winter, and from  $70^{\circ}$  to  $86^{\circ}$  in summer. Strong winds are seldom experienced; and during the day there is a cool sea breeze which changes to the land breeze at night.

Kona, a village a few miles inland, is considered one of the most healthy spots in the whole group, and especially beneficial to people suffering from weakness or disease of lungs or chest. Many visitors come here from California to pass the winter, and there are one or two commodious boarding houses for their accommodation.

**Harbour light.**—A small light is exhibited from Cook point, at the northern side of the inner part of the bay, when the local mail steam-vessel is expected.

Kealakekua bay is well known to history, as having been the scene of the death of Captain James Cook, R.N., the celebrated navigator, who was killed here by the natives on the 14th of February 1779.

On the western side of Kaawaloa cove, northward of and inside Cook point, is a village of the same name, where stands the monument erected in memory of Captain Cook. It is an obelisk on a square foundation, about 26 feet high; it had at one time become almost hidden by trees, but they having been cut down it is now clearly visible when approaching from the southward.

Except at Kealakekua village where there is a fine sandy beach, with a morai or burying place at one extreme and a small well of fresh water at the other, the shore all round the bay is rocky.

**Depth.**—In a direct line between Lava and Cocoanut points, there is no bottom at 50 fathoms when fronting the village and less than one mile from it. From this inwards it quickly shoals, and, in line between Cook and Cocoanut points, the depths are between 25 and 40 fathoms, and between Cook and Napupu points, from 30 to 10 fathoms, chiefly sand and shells; at 3 cables from the shore all round the bay, the depth varies between 10 and 25 fathoms. Between that line and the shore in the northern part of the bay there is a large space with from 7 to 10 fathoms.

---

\* See chart, No. 1,510, and plan of Kealakekua bay, on sheet of plans, No. 1,377.

**Anchorage.**—This bay is easy of access, but the anchorage is not good, owing to the great depth of water and foul state of the bottom. Between Cook and Napupu points, however, the bottom is mostly sand and shells; but in the vicinity of Napupu, it is rocky. Large vessels usually anchor in the middle of the bay, in about 16 fathoms, with Cook's monument bearing N.W., and Cocoanut point S.  $\frac{1}{2}$  E.

Kaawaloa cove, though exposed to winds from South and South-west, may be considered a safe anchorage except during the winter months, Cook point partially protecting it from the swell. In 1876, H.M.S. *Fantome* anchored in Kaawaloa cove in 30 fathoms,\* abreast of Cook's monument, mooring with a stern hawser to the shore; and during a stay of six weeks (in October and November) southerly winds were experienced only on two occasions, when a disagreeable swell set in although the wind was light; landing, however, was not interrupted.

**Directions.**—The summit of Mauna Loa, bearing E.  $\frac{3}{4}$  N., leads to Kealakekua bay, but should the summit of the mountain be obscured, which is often the case, the church on the slope of the hill, about a quarter of a mile inside Peterel point, is a good mark; it must, however, be borne in mind that churches, almost always white, are somewhat numerous on this coast, and care is required to discriminate between them. Another very good mark in approaching either from the northward or westward is the small crater of Puu-ohau, close to the shore and about  $1\frac{1}{2}$  miles northward of Lava point.

**Landing.**—The usual and best landing-place is at the village of Kealakekua, from whence a good carriage road exists to the coffee region. This is a good landing in ordinary circumstances, but if there is any swell setting in from the westward, boats are apt to receive injury from rocks near the pier with only from one to 2 feet water over them.

There is a good beach on which boats can easily land near the southern end of the high cliffs.

The landing in Kaawaloa cove, about half a cable southward of Cook's monument, is at the head of a small wooden pier. From this landing an indifferent road leads to Kona.

**Supplies.**—Beef, fowls, sweet potatoes, and plantains can be obtained in Kealakekua, also water at Napupu, a village southward of Kealakekua, but the tank is falling into decay; the water is brackish in all wells in the vicinity of Kaawaloa cove.

**Earthquake.**—On the 24th of February 1877 a slight shock of earthquake was felt at Kaawaloa, and steam was observed to be rising from the sea off Cocoanut point; on visiting the spot, it was found that

---

See chart, No. 1,510, and sheet of plans, No. 1,377.

\* By the latest survey the greatest depth in Kaawaloa cove is only 27 fathoms.

lumps of porous lava, some nearly a cubic foot in size, were rising to the surface, whence, on the contained gas escaping, they sank again. At the time of the earthquake a crack opened in the ground from Coconut point in an E.S.E. direction, extending for more than a mile, in some places 4 inches wide and 50 feet deep.

**Coast.**—From Kealakekua bay, the coast trends in a general S. by E. direction 21 miles to Ke-Au-o-Kanewaa, and from thence in a curve south-eastward for 19 miles to Ka Lae, the southern point of the island.

Almost the whole of this coast is lava, which lies in large masses miles in extent; in some places it is partially broken, exhibiting perpendicular cliffs, against which the sea dashes with fury. This formation extends half a mile into the interior, and as the distance from the sea increases, the lava becomes decomposed and capable of producing vegetation. Within this rocky barrier the country is rough and covered with blocks and beds of lava, more or less decomposed, but at 2 miles from the coast, it begins to be well covered with woods composed of various kinds of trees, and rendered almost impassable by a tangled undergrowth of vines and ferns. In some places, strips of these woods having escaped destruction, descend to within one mile of the coast. They are in no case parallel with the coast, but always lie in the direction the streams of lava have taken in descending from the mountains.

**ALENUHAHA CHANNEL**, which separates Hawaii from Maui and Kahoolawe islands, is 26 miles wide, and clear of dangers.

During the North-east trade, the wind frequently blows through the channel with great strength, and there is also a strong current setting westward; vessels from any of the western ports of Hawaii are therefore recommended to keep close in under the lee of the island until reaching Upolu point, when they will be enabled to fetch across to the Alalakeiki channel on the western side of Maui. Those from the northward, bound to Hilo, will probably find it impossible to weather Upolu point from the western side of Maui, but on getting under the lee of Hawaii the trade wind fails until reaching the southern point of the island, when they will have to beat against wind and current along the south-eastern coast, as described at page 198. A steam-vessel should pass to windward of Upolu point and proceed along the eastern coast of the island, as the trade wind fails when close in to the point and does not blow home with any force along the whole of this coast.

**MAUI ISLAND**, or Mowee, 43 miles long W. by N. and E. by S., is divided into two oval-shaped peninsulas, connected by a low isthmus, 6 miles across, and only a few feet higher than the beach.

---

See chart, No. 1,510.

At a distance, it appears like two distinct islands, but on a nearer approach the isthmus is seen. The whole island is volcanic, and was probably produced by the action of two adjacent volcanoes, which have ejected the immense masses of matter of which it is composed. The appearance of Maui resembles Tahiti more than the neighbouring island Hawaii. The eastern peninsula is the larger of the two, and is very lofty, rising to a height of 10,030 feet above the sea, but though the mountains are often seen above the clouds, they are never covered with snow.

Although on a first view the peninsulas resemble each other, on closer examination they are found to be very different. East Maui rises in one unbroken mountain. West Maui has many sharp peaks and ridges, which are divided by deep valleys, and which, in descending towards the sea, open out and form sloping plains of considerable extent on the northern and southern sides. The highest peak of West Maui, Mauna Ika, is 5,788 feet in height.

The isthmus consists of sand, which is constantly shifting and thrown up into dunes. It is too dry for cultivation, but during nine months of the year it is a fine grazing country, and feeds large herds of cattle, mostly owned by foreigners.

East Maui, though mountainous, has most cultivated land, and the rich volcanic soil of the Kula district, on the south-western side, raises abundant crops of potatoes. Wheat and other grain is also grown.

The productions of Maui are the same as those of the other islands ; to which may be added a few fruits, such as grapes, &c.

**Mauna Haleakala** is somewhat like Mauna Kea, in Hawaii ; the highest point, mount Kolakole, is 10,030 feet above the sea, and is destitute of trees to the height of about 2,000 feet ; then succeeds a belt of forest to the height of 6,500 feet, and again, the summit, cleft by a deep gorge, is bare.

The crater of Haleakala (or house of the sun) is the largest known crater in the world ; it is a deep gorge, open at the North and East, forming a kind of elbow ; the bottom, as ascertained by barometer, is 2,783 feet below the summit peak and 2,093 feet below the rim, and although its sides are steep, a descent is practicable at almost any part. The rim is over 12 miles in circumference and 2 miles wide at the broadest part. The inside of the crater is entirely bare of vegetation, and from the bottom arise some large hills of scoria and sand ; some of the latter are of an ochre-red colour at the summit, with small craters in the centre. All have the appearance of volcanic action, but the natives have no tradition of an eruption.

---

See chart, No. 1,510.

**KANAHANA POINT LIGHT.**—This point is the western point of La Perouse or Keonevie bay. On it stands a lighthouse, a rough wooden structure, from which is exhibited through an arc of  $202^{\circ}$ , viz., from  $N. 86^{\circ} W.$  through North and East to  $S. 45^{\circ} E.$ , a *fixed white light*, visible 11 miles. It has been observed that between the bearings of North and N.E. there are positions when the light becomes eclipsed by some intervening part of the structure.

**Coast.**—The south-western point of Maui, cape Hanamanioa, is about 3 miles E.S.E. from the light just described; it consists of rugged, craggy rocks, and the sea breaks at a little distance westward of it. The edge of the bank is steep-to, suddenly shoaling from no bottom at 80 fathoms to 25 fathoms, and then to 10 fathoms.

From cape Hanamanioa, the southern coast trends at first E. by N.  $\frac{1}{2}$  N. and then curves more in a north-easterly direction for 27 miles to Alau islet. The whole of this coast is rugged and affords no anchorage or shelter. From seaward, the land appears to ascend abruptly; it is densely covered with trees and vegetation, while here and there a few habitations appear.

**Alau islet**, off the eastern coast of Maui, is very small, and has a reef extending about 5 cables south-eastward from it. Other patches, with from 3 to 5 fathoms over them, lie southward and westward of the islet, distant about 2 cables.

**Rock.**—A sunken rock, with about 8 feet over it at low water, and 13 fathoms close around, lies 7 or 8 cables south-eastward of Alau islet.

**Kauiki head**, the eastern point of Maui, is an old crater connected by a low spit with the mainland, and at a distance appears like an island.

**KAPUEOKAHI** or **Hana bay**\* is formed by Kauiki peninsula and the islands off it, on the southern side, and by Nanualele point on the northern side; the distance between the two points being only 700 yards. The anchorage is well protected from wind and sea, and is very convenient.

**Twin and Pin rocks.**—The Twin rocks, 14 and 20 feet high, lie respectively  $1\frac{1}{2}$  and  $1\frac{1}{4}$  cables N.N.E. from the northern extreme of Kauiki head. Two pinnacle rocks lie nearer the head, the Inner Pin only 3 feet above water and on the same line as the Twin rocks; and the Outer Pin E.S.E.  $1\frac{1}{4}$  cables from the Inner Pin, and 5 feet above water. Both Pin rocks have deep water around, and are difficult to distinguish.

**Depths.**—In the centre of the bay is the Middle ground, a lava reef with only 6 feet water on which the sea generally breaks; it is connected with the shore, North, South, and West of it by depths of from

---

\* See chart, No. 1,510, also plan on sheet of plans, No. 1,490.



9 to 12 feet, and the same depths extend nearly a cable eastward of it, but an inlet between this bank and the rocks on the southern side of the bay affords good anchorage in  $4\frac{1}{2}$  or 5 fathoms.

**Directions.**—If from the southward, keep about 5 cables outside Kauiki head until the entrance is well open, then steer for it on a S.W. course, keeping close to the rocks on the port hand when entering, with a store-house down by the jetty in line with a Chinese cook-shop, a short distance above it, bearing S.W., and when the two Black rocks off the inner point are in line E. by N.  $\frac{3}{4}$  N., anchor in 5 fathoms, sand, stones, and mud.

**Anchorage.**—H.M. sloop *Sappho* anchored with the Black rocks in line N.  $70^{\circ}$  E.; and Nanualele point N.  $22^{\circ}$  E.; here she had a clear swinging berth with 30 fathoms of cable out, but this anchorage is only one cable wide, on account of the Middle ground. Outside a line drawn between the Black rocks and Nanualele point, there is anchorage right across the bay in from 4 to 9 fathoms.

From information obtained here, it would be better for those coming from leeward ports to take the passage westward of Maui, rounding the north-western end of that island and thus avoiding the very strong trade wind and current experienced in rounding the south-eastern point, against which steam-vessels have been unable to make headway at times.

**Coast.**—From Kapueokahi bay, the coast trends W.N.W. 22 miles and then 9 miles, W.S.W. to Kahului harbour. There is no shelter or anchorage in all this distance, and the coast is fully exposed to the force of the trade wind.

The northern coast of East Maui is a succession of deep ravines, which gradually diminish in width as they ascend, and are finally lost on the flanks of the mountains. Travelling along the coast in consequence becomes almost impossible. Cascades, several hundred feet in height, are seen falling into these ravines; they appear, however, to have but a small volume of water.

**KAHALUI HARBOUR**,\* situated between the coral reefs on the northern side of the low isthmus joining the two peninsulas, is about  $3\frac{1}{2}$  cables wide across the entrance, 4 cables deep, and is fully exposed to the northward.

Kahului is an important place for exporting the produce of the northern part of Maui, and railways connect it with Wailuku to the westward, and with Spreckelsville and Haiku to the eastward. In 1881, a jetty was being built out from the shore near the Custom-house, which it was proposed to extend as far as the edge of the reef.

---

\* See chart, No. 1,510, and plan of Kahului harbour, on sheet of plans, No. 1,377.

Hobron's flagstaff, near the low point, north-eastward of the town, is in lat.  $20^{\circ} 54' 15''$  N., long.  $156^{\circ} 29'$  W. (By the U.S. authorities in 1899 the lat. is  $20^{\circ} 53' 55''$  N. and long.  $156^{\circ} 27' 46.5''$  W.)

**A beacon** stands on the West extreme of the reef on the eastern side of the harbour, S.S.W.  $\frac{1}{2}$  W. from which are two buoys at half a cable and one cable respectively.

**Anchorage** may be obtained in from  $2\frac{1}{2}$  to 7 fathoms, with the shore end of the jetty bearing S.E. by E., distant  $2\frac{1}{4}$  and  $3\frac{1}{4}$  cables respectively.

**Tides.**—It is high water, full and change, at 11 hrs. 40 m.; springs rise from 3 to 4 feet.

**Wailuku.**—About 2 miles north-westward of Kahului is the flourishing village Wailuku, in which is the female seminary, an extensive range of coral buildings, beautifully situated on an inclined plane, with high and massive precipices behind; it is considered to be one of the best organised establishments in the Sandwich islands.

**Coast.**—From Kahului, the eastern coast of West Maui trends N.W.  $\frac{1}{2}$  N. 8 miles to Kahakulua point, and is an abrupt precipice several hundred feet in height. From Kahakulua point, the coast curves round westward for about 8 miles, and then southward for 9 miles to Lahaina.

**LAHAINA**,\* on the western side of West Maui, was at one time a flourishing place, much frequented by whaling vessels for refitting and obtaining supplies, but of late years the decline of the whale fishery has injuriously affected Lahaina, and it is now only visited by vessels loading with sugar, grown on the estates in the vicinity.

Lahaina occupies a distance of three quarters of a mile along the beach; it is principally composed of grass houses built as near the beach as possible; it has one principal street, with a few others at right angles to it. From seaward, the town may be recognised by some conspicuous buildings, especially Government house, which is near the beach and has a tall flagstaff before it.

**Anchorage.—Depth.**—There is an open roadstead off the town, completely sheltered from the trade wind by the high land of Maui; but the holding-ground is in places indifferent, the layer of sand being very thin with rocky ground below. The bank of soundings is much wider here than at most of the anchorages in these islands. At 2 miles from the shore there are from 30 to 35 fathoms, and at one mile about 20 fathoms. A good berth is in 12 fathoms, mud, with the flagstaff and North window of

\* See chart, No. 1,510, and plan of Lahaina roads, on sheet of plans, No. 1,490.

Government house in line, and Olowalu point on with Miller's hill, the hill on the western point of East Maui.

**LIGHT.**—From a square white lighthouse at the back of a small wharf about 150 yards north-westward of the court-house, at 26 feet above high water, is exhibited a *fixed* light, visible about 6 miles. The light has two burners and red glass on the N.W. and S.E. sides of the light-room window; the light therefore shows *fixed white* when fronting it, but *fixed red* either up or down the coast.

**Mooring buoy.**—A mooring buoy for the use of the island steamers is laid out in 8 fathoms water about 400 yards S.W. from the lighthouse wharf above described.

**Directions.**—As shoals on the north-western side of Maui extend a considerable distance from the shore, those bound for Lahaina roadstead should not approach the land nearer than 2 miles until the lighthouse bears N.E.  $\frac{1}{2}$  N., when, either by day or night, run in for it on that bearing and anchor as already described in 12 fathoms. Or if preferred, as from the time of obtaining soundings the water shoals gradually to the shore, anchorage may be taken up in almost any depth.

**Supplies** of all sorts can be obtained here; beef, vegetables, fruit, and water in abundance.

**Landing.**—The landing place is at a small pier, extending from the lighthouse, and protected by a breakwater.

**Tides.**—The tide at Lahaina is irregular, being somewhat dependent on the winds; it runs to the north-westward generally for sixteen hours out of the twenty-four.

**Lahainaluna.**—The most remarkable building to be seen as the roadstead of Lahaina is approached is the seminary of Lahainaluna, which was established in 1831; it stands on the side of the mountain that rises behind Lahaina ("luna" meaning "above").

**Coast.**—From Lahaina the coast trends E.S.E. about 9 miles to Kamalalaea bay. The southern side of West Maui has a forbidding appearance; the shores, however, are not so steep and rocky as elsewhere, and have generally a sandy beach.

There is a roadstead here called Paton by Vancouver, which is represented as a good anchorage, and may be easily found by attending to the following description:—"The large bay, formed by the two peninsulas and the sandy isthmus, has its western side formed by high rocky precipices, that rise perpendicularly from the sea. To the westward of these precipices the coast is chiefly composed of sandy beaches, and the

mountains at some distance from the shore form two remarkable valleys, separated from each other by a high rugged mountain, seemingly detached from the rest, and approaching nearer to the beach than those to the left and right of it. The anchorage at Patoa is abreast the easternmost of these valleys, which appeared fruitful and well cultivated."

**Kamalalaea bay** is the large bay on the south-western side of Maui between the two peninsulas, the western side of which is formed by rocky cliffs and precipices. Nearly in the middle of the western side is a village called Mackerrey by Vancouver, off which there is anchorage in 7 fathoms, sand and broken coral, about 3 cables off-shore.

The soundings on the eastern side of the bay are regular, but very rocky.

Near the head of this bay, in the north-eastern corner, is the small village Maalaea, where there are some sugar stores.

**Supplies.**—Sugar, wheat, maize, and potatoes are grown in this district; and abundant supplies of fresh provisions are obtained from Wailuku, about 6 miles distant across the isthmus.

**Anchorage.—Landing.**—The anchorage off Maalaea is not good, as the trade wind blows across the low isthmus in heavy gusts, and communication with the shore by boats is sometimes interrupted. Landing is effected at a small pier used for the loading and unloading of schooners; boats can always go alongside, the channel leading to the landing place being about 20 yards wide between two coral reefs. The best anchorage is in about 9 fathoms, sand, with the pier-head bearing N. by W.  $\frac{3}{4}$  W., and the western point of the bay S.W. by W.  $\frac{1}{4}$  W.

**Buoy.**—A spar buoy is moored in 6 fathoms, near the anchorage, for the use of the local mail steam-vessel, but it should not be trusted, as the chain is small, has been down a long time, and, so far as known, is not periodically examined.

Care must be taken when entering to keep the buoy well on the starboard bow; the water shoals gradually if not too near the western shore.

**Coast.**—From Maalaea, the coast trends S. by E. for about 9 miles in almost a straight line to Makena, near the S.W. extreme of the island.

**Makena,\*** or Makee's landing, is a small indentation in the western coast of East Maui, near the south-western extreme of the island, and derives the latter name from a planter whose estate is on the side of Manna Haleakala, on a plateau 2,000 feet above the sea, and about 5 miles eastward of the landing place.

---

\* See chart, No. 1,510; also plan of Makena landing, on sheet of plans, No. 1,377.

**Makena** may be recognised from seaward by Pau Olai (Round hill), 500 feet high, with a flagstaff on its summit, about one mile South of the landing and 2 miles northward of Kanahana point light, described at page 210. On a nearer approach, a stone church and several houses near the landing place will be seen.

**Buoys.**—Off the landing place are two mooring buoys for the trading schooners; the inner buoy lies in 5 fathoms, the outer in 8 fathoms.

**Anchorage.**—The anchorage is exposed to the heavy squalls which occasionally blow over the low isthmus in the centre of Maui; and landing is at times impracticable for ship's boats, owing to the heavy surf. The holding-ground also is not good, and vessels have sometimes dragged in the squalls. The anchorage is in from 10 to 12 fathoms, sand, about 3 cables from the landing place, with Pau Olai flagstaff bearing S.  $\frac{3}{4}$  W. and the stone church E. by S.  $\frac{3}{4}$  S. From this position the depths gradually decrease to 3 fathoms near the shore.

**MOLOKINI** is a small, barren island, 160 feet high and composed entirely of lava; it lies  $2\frac{1}{2}$  miles W. by S.  $\frac{3}{4}$  S. from Makena, and is only visited by fishermen, who dry their nets on its barren surface. It appears to be the southern half of a crater and is steep to both on its convex and concave sides. The only landing place is on the northern side near the western point, from which a dangerous reef, with only 9 feet at its extreme, extends 2 cables in a north-westerly direction. Being almost in mid-channel between East Maui and Kahoolawe, Molokini would prove a dangerous obstacle to navigation, were it not that its height renders it at all times visible from vessels passing between the islands.

**KAHOOLAWE** or Tahurowa is separated from East Maui by the Alalakeiki channel, 6 miles wide, is about 11 miles in length N.E. and S.W., and 7 miles wide. It is low, the highest part being near the north-eastern end, and almost destitute of vegetation with the exception of a species of coarse grass. The rocks of which it is formed are volcanic, but nothing is known of any active or extinct craters on the island; and, from its shape and appearance, it is not improbable that it once formed a part of Maui, from which it may have been detached by some violent convulsion connected with the action of the adjacent volcanoes of Maui or Hawaii.

At one time this island was used as a convict station, but it is now chiefly useful as a sheep run, the soil of decomposed lava being too poor for cultivation.

**Shoal.**—Off the south-western extreme, Kealaikahiki point, is a shoal which was seen by Cook on his discovery of the island. In 1841, it was

examined by Wilkes, who proved it to be much nearer the land than was anticipated. It extends  $1\frac{1}{2}$  miles from the point, and has  $1\frac{1}{2}$  fathoms over it. Vessels may pass within 2 miles of the western end of the island with safety, but 3 miles would be a better distance, as nothing is gained by approaching it closely.

**LANAI**, or Ranai, 16 miles north-westward of Kahoolawe, and separated from West Maui by Auau channel  $7\frac{1}{2}$  miles wide, is a dome-shaped island, 15 miles long N.W. and S.E., by 10 miles wide. It appears to have been frequently rent, large fissures being apparent in its sides.

The centre of this island is much higher than Kahoolawe, but is neither so high nor broken as the other islands. Great part of it is barren, and it suffers much from the long droughts which prevail; the ravines and glens, notwithstanding, are filled with thickets of small trees. The island is volcanic, the soil shallow, and by no means fertile; the coast abounds with shell-fish.

Near the shore, on the western side, are the Five Needles rocks, about 120 feet in height.

The southern shore of Lanai is usually avoided by masters of vessels acquainted with the navigation among these islands, on account of the light and variable winds or calms generally experienced there; the trade wind being interrupted by the high land of Maui and Lanai.

It is not unusual for vessels to be becalmed here for six, eight, or even ten days. The natives, in the small craft belonging to the islands, usually keep close inshore, avail themselves of the gentle land breeze to pass the point in the evening, and run into Lahaina with the sea breeze in the morning; but this is attended with danger, as there is usually a heavy swell rolling in towards the land.

**MOLOKAI**, or Morotoi, lies northward of Lanai, from which, and from the north-western end of Maui, it is separated by the Pailolo channel,  $6\frac{1}{2}$  miles wide.

It is apparently formed by a chain of volcanic mountains, about 35 miles long, East and West, and 8 miles wide. The mountains are high, and broken by deep ravines and watercourses, their sides clothed with verdure, and ornamented with shrubs and trees. One third of the island, towards the western end, is a barren waste, scarcely susceptible of cultivation; it has in consequence but few inhabitants, who are engaged mostly in fishing. The eastern two thirds are almost one entire mountain, rising gradually from the South, until it attains a height of 2,500 feet, while on the North it is almost perpendicular.

---

See chart, No. 1,510.

On the southern side is a narrow strip of low land, not exceeding a quarter of a mile in width, and here dwell the greater part of the population; the soil is very rich. Owing to the want of moisture, however, few plants will thrive even here; resort is therefore had to the uplands, which are found to be susceptible of the highest degree of cultivation.

**Lae-o-ka Laau**, the S.W. extreme of Molokai, is a low black point, in lat.  $21^{\circ} 6' N.$ , long.  $157^{\circ} 18' W.$  A reef which breaks heavily extends 4 cables westward of the point.

**LIGHT.**—From a white lighthouse with a red lantern on Lae-o-ka Laau, at 50 feet above high water, is exhibited a *fixed white* light, visible 11 miles.

**Coast.**—On the southern side of the island are several small harbours within the reef; the best is Kaunakakai, 15 miles E.  $\frac{1}{2}$  N. from Lae-o-ka Laau.

**Caution.**—The southern coast of Molokai should not be closely approached at night without local knowledge, as the reef which fringes the shore is steep-to, and extends seaward in some places to a considerable distance.

**Kaunakakai\*** is situated on the southern side, and midway between the two extremes of Molokai; from it, the West extreme of Lanai island bears South. From Lahaina, Molokai has the appearance of being two islands, the lowest land not being visible; a course steered for this apparent gap leads direct to Kaunakakai.

**Depths, &c.**—The harbour is merely a break in the fringing coral reef about  $1\frac{1}{2}$  cables wide and receding 3 cables in a N. by E. direction to its head, where it terminates in a series of mud and sand flats which separate its head by another space of 550 yards from the shore, where stands the village church, school, &c. Over these mud and sand flats there are generally from one to 3 feet water, but in many parts it dries at low water. The harbour is divided into an outer and inner anchorage; the former is  $2\frac{1}{2}$  cables outside the line of reefs, in from 7 to 9 fathoms, and is marked by a spar buoy; the anchorage is not good, owing to the uneven nature of the bottom. The latter, with from  $2\frac{1}{2}$  to 6 fathoms, affords but a limited space, but a substantial wharf with from 19 to 12 feet alongside, soft muddy bottom, has been constructed on the eastern side near the Black rock, which covers at half tide; the wharf is connected with the shore by a causeway across the flats built partly on piles and partly of solid stone work.

**Harbour lights.**—Leading lights are exhibited from posts on the land at the head of the harbour when mail steamers are expected. The

---

\* See chart, No. 1,510, and plan of Kaunakakai harbours, on sheet of plans, No. 1,490.

inner light, about 170 yards from the outer, is *fixed red*; the outer, *fixed white*. When in line N. 25° E. they lead directly up both to the spar buoy and to the mooring buoy.

**Directions.**—When approaching the outer anchorage, bring the leading light posts in line N.N.E.  $\frac{1}{4}$  E., and anchor in from 7 to 8 fathoms, rock and sand, near the spar buoy; or run on past the spar buoy in mid-channel to the inner anchorage. The light posts are easily identified by the lantern affixed to each.

**Tides.**—It is high water, full and change, at Kaunakakai, at 3h. 20m.; rise, about 2 $\frac{1}{2}$  feet.

**Kamalo harbour**,\* 5 miles eastward of Kaunakakai, is a reef harbour 2 $\frac{1}{4}$  cables wide in the entrance but with only 2 fathoms on the bar. A wedge-shaped tongue of reef extending southward from the shore into the entrance divides the harbour into two arms, of which the western recedes N.N.W. 5 cables with from 6 to 7 fathoms, and the eastern recedes in a general N.N.E. direction for 6 cables, with from 5 to 7 fathoms, but is very narrow for the greater part of its extent.

**Pukoo harbour**\* is a very confined reef harbour, 8 miles eastward of Kamalo, with from 3 to 5 fathoms over an area about 2 cables long North and South by one cable wide.

**Harbour lights.**—From two posts on the shore, harbour leading lights are shown when a mail steamer is expected. These lights or light posts in line lead in the harbour N.W.  $\frac{1}{4}$  N. and a vessel should anchor on that line.

**Tides.**—At Kamalo and at Pukoo harbours it is high water, full and change, at 3h. 15m.; the rise 2 $\frac{1}{2}$  feet.

**Coast.**—From Pukoo, the coast trends N.E.  $\frac{1}{2}$  E. 8 miles to the south-eastern extreme of the island. About 1 $\frac{1}{2}$  miles South from this point are the two small barren rocky islets, Mokuo Niki; in some directions they appear as one islet, but are open of each other on a S. by E. bearing.

From the S.E. point, the coast turns northward for about 2 miles past Kalaua to Halawa point, the N.E. extreme, and is fronted by a reef extending about one mile from the shore. From this point, the northern shore trends W.  $\frac{1}{2}$  S. 13 miles, to the base of a peninsula which projects about 2 miles from the coast, on which is Kalanao, the leper reservation for the Sandwich islands.

---

\* See chart, No. 1,510, and plans of Kamalo and Pukoo harbours, on sheet of plans, No. 1,490.



**Kalanao** is near the centre of the North coast of Molokai, at the base of very precipitous mountains. The leper establishment was erected here about 1865, and since its erection, and the consequent separation of the victims of this terrible disease from the healthy inhabitants of the islands, the spread of the malignant malady has been arrested, and is now much on the decrease. The self-sacrificing life and death of the late Rev. Father Damien will ever be associated with this establishment.

The anchorage is to the southward of a long low point extending from the foot of two remarkable steep mountains; it cannot, however, be considered safe, being exposed to the heavy swell that occasionally sets in.

A red buoy for the use of the local mail steam-vessel, is moored in 13 fathoms; if brought in line with the church, bearing East, it leads up to the best anchorage, in from 13 to 16 fathoms, dark sand.

H.M. sloop *Peterel* anchored here in  $13\frac{1}{2}$  fathoms, about half a cable westward of the buoy, with the church bearing E.  $\frac{1}{2}$  N., and North point, N.  $\frac{3}{4}$  E.

Landing at Kalanao, always difficult, is at times dangerous, and no supplies can be obtained.

**Coast.**—From Kalanao, the coast trends 15 miles westward to *Lae-o-ka Ilio*, the N.W. extreme of the island, and then turns southward for 8 miles to *Lae-o-ka Laau*; in the northern half, between these two points a bay exists, but the coast-line of the southern half is nearly straight, and composed alternately of rugged rocks and sandy beaches. In 1793, Vancouver anchored for the night in 19 fathoms, sandy and bad holding-ground; when working up, the soundings were pretty regular from 17 to 60 fathoms, fine sandy bottom; the anchorage was within a mile of the breakers, *Lae-o-ka Laau* bearing South 4 miles; and *Lae-o-ka Ilio*, N.  $26^{\circ}$  E., about the same distance. This position is as close as vessels can lie with safety, as this side of the island is exposed to North and N.W. winds, and to the heavy sea almost constantly rolling in on the shore from that quarter, making landing almost impracticable.

**KAIWI CHANNEL.**—The Kaiwi channel, 22 miles wide, separates Molokai from Oahu island. It is of great but very irregular depth in the approach from the north-eastward, from upwards of 1,500 fathoms with *Lae-o-ka Ilio* bearing South 15 miles until with the same point bearing East the mid-channel depths are from 250 to 350 fathoms; about these latter depths will be preserved in running through the channel until the vessel runs off the bank again into ocean depths if a distance of from 5 to 7 miles from the coast of Oahu is maintained; but a vessel steering more to the southward will, in the southern entrance to the

channel, strike soundings on a large bank of sand and coral, apparently almost circular and about 15 miles in diameter, over which the general depths are from 24 to 35 fathoms, and the least known depth 22 fathoms. It is probable that this bank is connected with Molokai, but in this direction no soundings have been taken. On all other sides the soundings increase quite suddenly when leaving the general depths of the bank to upwards of 200 fathoms.

**OAHU**, or Woahoe, lying W.N.W. of Molokai, is the principal island, though only the second in size, of the group, as it contains Honolulu, the port chiefly frequented by the shipping of the North Pacific, and the seat of Government. It is the most fertile of the islands, about 40 miles long N.W. and S.E., by 20 miles wide, and resembles in the varied features of its natural scenery several of the Society islands. Its appearance from the anchorage off Honolulu is remarkably picturesque; a chain of lofty mountains, the Konahaunui or eastern range, rises near the centre of the eastern part to a height of 3,175 feet, and descends near the middle of the island into the Ewa plain, which divides those mountains from the Kaala mountains that rise to a height of 4,030 feet, in an irregular broken line parallel with the south-western coast.

Ewa plain is nearly 20 miles in length, from Pearl river to Waialua, and in some parts 9 or 10 miles across; the soil is fertile, and watered by a number of rivulets which wind their way along the deep watercourses that intersect its surface and empty themselves into the sea.

The whole island is volcanic, and in many parts inactive craters of large dimensions may be seen, the best known of which are Diamond and Punch Bowl hills, near Honolulu; but from the depth of mould with which they are covered, and the trees and shrubs with which they are clothed, it may be presumed that many ages have elapsed since any eruption took place.

The plain of Honolulu exhibits in a singular manner the extent and effects of volcanic agency; it is not less than 9 or 10 miles in length, and, in some parts, 2 miles from the sea to the foot of the mountains; the whole plain is covered with a rich alluvial soil, in places 2 or 3 feet deep; beneath this a layer of fine volcanic ashes and cinders extends to the depth of 14 or 16 feet; these also lie upon a stratum of solid rock, by no means volcanic, but evidently calcareous, and apparently a kind of sediment deposited by the sea, in which branches of white coral, bones of fish and animals, and several varieties of marine shells have been found.

A number of wells have been sunk in different parts of the plain, in which after penetrating through the calcareous rock, sometimes 12 or 13 feet, good clear water has been always found; the water in all these wells is perfectly free from any salt or brackish taste, though it

invariably rises and falls with the tide, which would lead to the supposition that it is connected with the waters of the adjacent ocean, from which the wells are distant from 100 yards to three quarters of a mile.

**Makapuu point**, the eastern extreme of Oahu, is a rocky bluff 642 feet high, in the face of which are numerous caves; their mouths are at two thirds the height of the bluff, and are accessible by ascending the side of the bluff obliquely. These caves were formerly used by the natives as burial places; they are the effect of volcanic action, and are called *Kaualahu*.

It is proposed to establish a light on this point.

**Coast.**—The north-eastern side of the island, when viewed from seaward, appears to be formed of detached hills rising steeply from the sea, with rugged and broken summits; the hills are covered with wood, and the valleys between them are fertile and well cultivated.

The coast from Makapuu point to the Mokapu peninsula trends N.W. 10 miles, and off it are some scattered islets and rocks, some of which are as much as one mile from the shore; about one mile North from the eastern extreme of Mokapu peninsula are the Moku Manu rocks.

Between Mokapu peninsula and Kaoio point, 8 miles to the north-westward, is a deep inlet or bay almost completely blocked by reefs and shoals; but a 9-foot passage through the reefs leads under the lee of the peninsula into Waialai harbour, accessible only to the smaller coasting vessels.

Kaneohe, in the Kula district, is the principal place on this side of the island, and is situated near Waialai harbour, just beneath the Pali of Nuuanu, at the back of Honolulu. The climate is cooler here by a few degrees than that of the opposite or lee side of the island, and frequent showers maintain a constant verdure.

From Kaoio point, the trend of the coast is N.W. for 14 miles to Kahuku point, the northern extreme of the island, which is low, flat, and has a reef extending off it  $1\frac{1}{2}$  miles or more.

Along this coast there is a narrow strip of land, varying from half a mile to 2 miles in breadth, and only a few feet above the level of the sea; it is very fertile, and has a gradual ascent to the foot of the precipices. The scenery of this district is hardly to be surpassed in beauty, boldness, and variety; stupendous precipices rising some 2,000 feet and more, with small streams rushing over and down their sides.

From Kahuku point, the coast turns S.W. by S. for 11 miles to Waialua, where is a large village, and at about one mile from the shore are regular soundings of from 13 to 20 fathoms. As far as Waimea, it is a level plain stretching about 2 miles inland, but slightly raised above the sea, and affording good pasture. At many of the frequent holes and crevices in it.

may be seen streams of fine clear and cool fresh water, making their subterranean way, 3 or 4 feet below the surface, from the mountains to the outlets in the sea below low water mark.

**Waimea bay\*** is a slight indentation in the coast, about 4 miles north-eastward of Waialua, and was visited by the *Resolution* and *Discovery* in 1779, shortly after the death of Captain Cook; they anchored in 13 fathoms, sand, with the extreme points of the bay bearing S.W. by W.  $\frac{1}{2}$  W. and N.E. by E.  $\frac{3}{4}$  E., and the mouth of a river S.E.  $\frac{1}{4}$  E. distant one mile.

There appears, however, to be good anchorage much closer in, in 9 fathoms, with the entrance of the river bearing East from  $2\frac{1}{2}$  to 3 cables, and the outer Black rock, to the southward, from South to S.S.W. distant about 2 cables.

In the bight of the bay, southward of the anchorage, there is rocky foul ground 2 miles from the shore, and no landing on the coast to leeward, on account of a coral reef which stretches along the shore to a distance of half a mile.

**Waialua\*** lies at the northern end of the Ewa plain, at the foot of the Konahaunui or eastern range of mountains, while the northern slope of the Kaala range nearly reaches it. The coast here forms a small bay, with extensive reefs on all sides, and has a dreary aspect on first landing. The soil is sandy and poor; but a short distance inshore an agreeable change takes place.

It was near this place that Mr. Gooch, the astronomer to Vancouver's expedition, and Lieutenant Hergest were killed by the natives in 1792.

**Harbour lights.**—Two small leading lights, showing only when the mail steamer is expected, when in line bearing S.  $55^{\circ}$  E. lead between the reefs up to a buoy, and very restricted anchorage, not more than 100 yards wide and close to the shore.

The line given leads in nothing less than 7 fathoms, though close along the edge of the northern reef.

**Tides.**—It is high water, full and change, at 3h. 40m.; rise, 2 to 3 feet.

**Coast.**—From Waialua, the coast trends W. by S. 9 miles to Kaena point, the western extreme of the island, which stretches out in a long narrow point. From Kaena point, the general trend of the land is S.E.  $\frac{1}{2}$  S. for 20 miles to Laeloa or Barber point, the south-western extreme of the island. This side is principally composed of steep craggy mountains, some descending abruptly to the sea, others terminating at a

---

\* See chart, No. 1,510, and plans of Waimea and Waialua, on sheet of plans, No. 1,490.

short distance from it, in which case a low border of land extends to the coast, which is formed by sandy beaches, bounded by rocks on which the surf breaks heavily.

Mauna Kaala, 4,030 feet high, which overlooks this coast, has the appearance of being a flat-topped mountain; but such is not the case, the evenness of the ridge alone giving it that appearance.

**Waianae.\***—Nearly in the middle of this side of the island is Waianae village, a place of some importance in consequence of its sugar mills and the plantations in its neighbourhood, which have caused it to be connected by railway with Honolulu; the line running close along the coast both southward and northward of the village. In its neighbourhood, the bases of the mountains are farther from the shore, and a narrow valley, presenting a fertile and cultivated aspect, seems to separate the hills and wind for some distance through them. The coast at the entrance of this valley forms a small sandy bay, and on its southern side between two high rocky precipices, in a grove of cocoanut trees, stands the village.

About one mile north-westward of the village, is Lahilahi, a high rocky point, very remarkable in that it projects from a sandy beach; so that at a short distance it appears to be detached from the land. Between Lahilahi and the high rocky point southward of the village, is a bank of soundings extending some distance to seaward. On the southern side of this bank the soundings are irregular, from 8 to 25 fathoms, rocky bottom; but northward of it, near the Lahilahi rock, no bottom was obtained with 100 fathoms of line, though not more than  $2\frac{1}{2}$  cables from the shore; this was found to be the case also a short distance southward of the bank.

**LIGHT.**—Laeloa or Barber point, the S.W. extreme of Oahu, extends in a long narrow spit. Near the extreme point stands a lighthouse built of coral, lantern painted red, from which, at 43 feet above high water, is exhibited a *fixed white* light, visible 10 miles.

**Coast.**—From Laeloa point, the coast trends E.N.E.  $7\frac{1}{2}$  miles to the entrance of Pearl river. The shore is low and flat, covered with bushes and scattered tufts of grass, and fronted by a coral reef.

**Soundings.**—From the edge of the coral reef, the soundings deepen gradually to seaward, but in places they appear to extend much farther than had been supposed. In December 1891, H.M.S. *Gannet* searched for a danger reported by the s.s. *Oceanic* to exist  $2\frac{3}{4}$  miles S.E. by E. from

---

\* See chart, No. 1,510, and plan of Waianae, on sheet of plans, No. 1,490.

Barber point lighthouse; the weather was unfavourable, and no danger was found, but the depth was only 16 fathoms, coral, with the lighthouse bearing N.  $41^{\circ}$  W.  $2\frac{1}{4}$  miles, and that depth continued for some distance parallel with the shore to the eastward. This was evidently close to the edge of the bank, for when the ship was allowed to drift off-shore, the water quickly deepened to 22 and then 41 fathoms, the latter depth with the lighthouse bearing N.  $44^{\circ}$  W.  $2\frac{3}{8}$  miles.

**PUULOA or PEARL RIVER and lochs,\*** on the southern side of Oahu island, and 5 miles westward of Honolulu entrance, is a large irregular-shaped inlet, greatly cut up by projecting points and islands, but containing three large open spaces known as the West, Middle, and East Pearl lochs. The name is derived from the circumstance that the pearl oyster is found here, and it is the only place in these islands where it is known to exist.

The whole inlet has somewhat the appearance of a lagoon partially filled up by alluvial deposits, but connected with the sea by the Pearl river, a narrow channel upwards of 2 miles in length, the entrance to which is through a break upwards of 4 cables wide in the coral reef, which here extends nearly a mile beyond or southward of the coast-line.

**Bar.**—A bar consisting of coral sand, easily removed by dredging, has formed at the entrance of this channel which at present renders it useless to all but small craft, as it now has only 11 feet water where there were 12 feet in 1882, and 15 feet in 1841. The U.S. Government, however, in consideration of the natural advantages and capabilities of the harbour, have apparently resolved to turn it to account, and, as a preliminary measure, obtained in 1895 the approval of Congress to the appropriation of a sum of \$100,000 for the purpose of dredging a channel through the bar to a depth of 31 feet; which work has, however, not as yet been commenced.

To obtain a depth of 31 feet, about 1,000 yards of the channel would have to be dredged, but to obtain a depth of 18 feet, only about 325 yards. In any case, after passing the bar, the navigable channel of the river averages about 110 yards in width, but with ample depth for any vessel; and, should the proposed improvements be carried out, Pearl harbour would become the best and most capacious harbour in the islands of the North Pacific.

On the western side of the channel, within the bar, is Puuloa village, in the neighbourhood of which are large salt works; and near the entrance, on the eastern side, is a large yellow building, called Queen Emma's house, but which is not easy of recognition.

---

\* See plan of Pearl lochs, on chart, No. 1,510

The leading mark at present used for crossing the bar is a high wind-mill frame at Puuloa slightly open eastward of the meeting of the high land of the Waimea mountains, with the flat neck of the Ewa plain below it. The channel across the bar is easily distinguished by the discoloured water on either side, and when within it the change of colour to the deep water is very distinct. No directions other than the careful use of the chart can be given for entering Pearl harbour.

About one mile above Puuloa village, Waipio point, the southern end of the Waipio peninsula, projecting into the channel causes it to bifurcate. The north-western branch leads by a tortuous channel  $2\frac{1}{2}$  miles in length into the open water of the West loch. The northern branch, or Pearl river proper, in a distance of 2 miles leads into the Middle loch, leaving Ford island on the starboard hand; but on each side of Ford island are deep channels leading up into the East loch, which is separated from the Middle loch by the projection known as Pearl city peninsula. The S.E. loch, south-westward of Ford island, with other small lochs and inlets, open out in all directions from these the main channels and inlets.

The Oahu railway skirts these lochs closely the whole way round from S.E. loch to the south-western corner of West loch; and a branch line runs down Pearl city peninsula.

Above the bar and as far as Waipio point, the Pearl river, from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  cables wide, is bordered by coral reefs and sand flats, the edges of the navigable channel being very steep-to; above Bishop point are steep volcanic bluffs from 10 to 30 feet high, and on both sides algeroba trees and other brushwood grow. A cattle range extends away westward of the West loch, and on its northern and western sides, as elsewhere in the neighbourhood, are sugar plantations irrigated by means of artesian wells. These extend along the inshore side of the Pearl lochs and behind them the land rises gradually to the Ewa plain.

Waipio and Pearl city peninsula are both low, and within them are enclosed several large fish ponds; rice and taro are also cultivated here. At the southern end of Pearl city peninsula are many picturesque cottages, chiefly used as summer residences by Honolulu people, and at its northern end is the church and small collection of houses called Pearl river city, which is provided with water by pipes from a reservoir in the mountains; the only means at present by which a vessel could obtain water at Pearl harbour.

**Depths.**—As already stated, the present depth on the bar being only 11 feet, the navigation of this extensive system of inland waters is now limited to vessels of less than that draught. Immediately within the bar, however, the water deepens, and up to Waipio point there are from 10 to

---

See plan of Pearl lochs, on chart, No. 1,510.

20 fathoms. In the channel leading to the West loch there are from 7 to 9 fathoms; in the lower part of the West loch, from  $4\frac{1}{2}$  to 7 fathoms, and in the upper part from  $1\frac{1}{2}$  to 3 fathoms. In the three channels leading into the Middle and East lochs there are from 5 to 7 fathoms, except in that leading southward of Ford island, where there is a patch with only 20 feet. Both lochs shoal towards their heads, but in both they open out from the channels to fine open spaces with from 5 to 7 fathoms water.

**Anchorage.—Tides.**—Good anchorage may be taken up outside the bar in not less than 10 fathoms. Vessels small enough to cross the bar, may anchor anywhere in the lochs in suitable depth; but not in the channels, the water being everywhere too deep and the channels too narrow for safe anchorage. The tides are about the same as at Honolulu, and the streams in the narrowest parts of the channel seldom run more than half a knot; in the lochs they are scarcely perceptible.

**Winds.**—In summer, the N.E. trade blows fresh in Pearl harbour, strongest in July and August, and felt most in East loch. In winter, the “Kona” wind sometimes blows with some force.

**COAST.**—About 2 miles eastward of the Pearl lochs, the same distance inland, and 3 miles north-westward of Honolulu, is a remarkable circular salt-water lake, about half a mile in diameter, and so highly impregnated with salt, that twice every year the natives take out large quantities of fine hard clear crystallised salt, which forms a very valuable article of commerce.

Between Pearl river and Honolulu harbour, at about one mile westward of the latter, is a gap in the coral reef named Kalihi entrance; it leads nowhere but on to the coral flat, which is very extensive hereabouts, and is only fit for and used by canoes.

**HONOLULU,\*** the capital and principal port of the Hawaiian islands, is situated on the southern side of Oahu, on a narrow plain at the south-western foot of the eastern range of mountains. It was unknown to Cook and the early navigators, and even when visited by Beechey, in 1827, it was an inconsiderable town of grass huts. The visits of vessels belonging to the large whaling fleet to refit, first brought it into notice, and was productive of much wealth; and on changing the seat of Government from Hawaii to Honolulu, the town as a city rapidly grew in importance and appearance. Being in the track of vessels running between America, China, and Australia, it affords a convenient stoppage place, and whatever may be done to improve Pearl harbour, it is certain that under the sovereignty of the United States, a great future must lie before this city.

---

\* See plan of Honolulu harbour; scale,  $m = 9.0$  inches, No. 1,378.



The aspect of the country around Honolulu, as seen from the Roads, is generally barren. The plain on which the city is built extends both eastward and westward from it, whilst behind it the land rises gradually towards the Nuuanu valley. Several crater-shaped hills are in sight, one of which, named Puowina or Punch Bowl hill, 498 feet in height, lies close to the north-eastern side of the city.

The city consists of regularly laid-out streets, on either side of which stand houses and warehouses constructed after the European style, frequently within spacious enclosures with gardens, and mostly lighted by electric light and with telephonic connections. Amongst the principal buildings are the fine and spacious Government structures, in which are included all the public offices; also the Executive Mansion, two hospitals, several churches and chapels belonging to the different religious denominations, a Custom-house, and several schools, some of which for the natives are with compulsory education, which system has had the most satisfactory results, as the increased knowledge of the inhabitants testifies.

The site on which the Transit of Venus was observed in December 1874, about 750 yards S.E. by E. from the Custom-house lighthouse, is in lat.  $21^{\circ} 17' 57''$  N., long.  $157^{\circ} 51' 35''$  W.

**Hospitals.**—There is a good general hospital, at which seamen and others are admitted on payment of \$1.25 per diem. The quarantine hospital is on the western side of Honolulu harbour, on ground reclaimed on the coral reef. It communicates with a small wharf near the edge of the reef at the harbour by means of a pier and tramway 830 yards long.

**The population** is now rapidly on the increase; in 1890 it numbered about 21,000, but in 1896 it had increased to 29,920.

**Consulate, &c.**—Being the seat of Government, a Commissioner and Vice-consul for England, Commissioner and Consul for France, and Consuls or Vice-consuls for most of the naval powers reside here.

**Trade.**—The principal article of export is sugar; it comprises 96 per cent. of the whole exports, the remaining 4 per cent. being made up of small quantities of rice, coffee, hides, and wool; and practically the whole of the exports are to the United States. The imports are wines, spirits, and machinery for sugar mills from the United States, though much of this machinery is now home-made, the Honolulu Ironworks being an institution quite up to the times and turning out excellent work. Manchester goods, but in gradually smaller quantities, still come from England; coal, to the extent of about 70,000 tons per annum, comes chiefly from British colonies, British Columbia, Australia, and New Zealand.

The total exports for the year 1897 amounted in value to £3,304,500, being an increase of £104,500 over the preceding year. The imports amounted in 1897 to £1,823,900, and show an increase of £345,200 on those of the year 1896.

**Communications.**—The Oceanic Steamship Company has three vessels running between San Francisco, Samoa, and Auckland, N.Z., and Sydney in Australia, calling here once a month each way, remaining in harbour for six daylight hours; the line consists of one English and two American steam-vessels. There is also a monthly steam-vessel from San Francisco, which arrives on the intermediate fortnight, and waits at Honolulu for a week, so that the return steam-vessels both leave within a few days of each other. There are also steam-vessels to Yokohama and Hong Kong occasionally, and vessels of the Canadian Pacific line run between Vancouver island, Honolulu, Fiji, and Sydney, N.S.W.

Communication between the islands is kept up by several small but effective steam-vessels and sailing schooners.

**The climate** of Honolulu is generally very pleasant and healthy, especially when the North-east trade prevails, but southerly and south-westerly winds are called by the natives "sick-winds," because they are followed by small ailments, gastric maladies, and intermittent fevers, as is the case with the scirocco in Europe. Fortunately the "sick-winds" are of rare occurrence. See also Climate, Winds, and Weather, with tabular statements at pages 193–195.

**Supplies** of all kinds are plentiful; beef, mutton, fowls, eggs, vegetables, and fruit can be obtained at moderate prices. Water can be procured alongside the wharf, or, when lying off, by a steam water-tank; it is good, but very expensive, 1½ dollars per ton alongside the wharf, 2½ dollars per ton by tank at the inner anchorage, and an additional and excessive charge for taking it to a vessel outside the reef.

**Coal.**—Welsh, Australian, or British Columbian coal of good quality can be obtained from the European firms in Honolulu. About 5,000 tons is the quantity generally kept in stock, but, though never scarce, it varies with the season; Australian costs from \$8 to \$9 per ton; British Columbian, from \$10 to \$11; Welsh coal, from \$12 to \$15 per ton. Ships are coaled either alongside the Pacific M.S.S. Co's. wharf in 27 feet water, the Oceanic wharf in 30 feet water, or, lying off, by means of lighters.

**Repairs.**—There are foundries, workshops, and shipyards, where considerable repairs can be effected. Engines up to 70 horse-power have been built here, and those up to 8,000 indicated h.p. repaired. Cylinders of 126 inches diameter can be cast and bored, and a pair of sheers capable of lifting 50 tons is to be erected.

**Patent slip.**—A patent slip has been constructed on the eastern side of the harbour opposite the outer lighthouse; it is 187 feet long on the cradle and capable of taking up a vessel of 1,400 tons with her weights out. In 1889, the U.S.S. *Nipsic*, of 1,375 tons displacement, was hauled up, her guns and coal having been previously removed. Proposals are under consideration for improving its capacity.

**Outer anchorage.**—Outside the reef and a short distance to the eastward of the entrance to the harbour, from one cable N. by W. to 3 cables W.N.W. from the Fairway bell-buoy, anchorage may be obtained in from 8 to 12 fathoms, but the holding-ground is not good, the bottom being hard sand and coral and very uneven. Although this anchorage is safe during the summer, when the trade wind is steady, it is not advisable to use it during the winter, when the winds are variable, and squalls from the southward with a heavy sea are not uncommon.

**HONOLULU HARBOUR** is formed by an opening in the coral reef, about 150 yards wide at the entrance, 300 yards wide off the town, and rather more than one mile in length in a North and South direction; but though small it is capable of accommodating a good many vessels moored head and stern, the smooth water inside enabling them to secure close to one another.

**Depths.—Bar.**—A passage 200 feet wide has been dredged through the bar to a depth of 30 feet, where formerly there were only 20½ feet. A great deal of dredging has been done in the harbour, especially in the upper part, where large wharves have been constructed, and generally within the harbour the depths are from 27 to 30 feet or deeper. The passage over the bar is defined by buoys, lights, and marks as presently described.

**Wharves.**—The railway crosses the flats at the northern end of the harbour, and terminates in two wharves, with 19 feet water alongside each of them; the western wharf is used by ships. The space between the railway wharves and those eastward of them has been dredged to a depth of from 27 to 28 feet. There is at present about 1,200 feet of wharf frontage, with from 30 to 27 feet, and over 2,000 feet with from 17 to 19 feet, and less.

**The Time signal** is a whistle sounded twice daily at the Planing mill by electric signal from the Survey office; first, at noon mean time of the meridian of 157° 30' W., equivalent to 10h. 30m. 0s. Greenwich mean time; secondly, at 1h. 30m. 0s. p.m. mean time of the same meridian equivalent to 12h. 0m. 0s. Greenwich mean time.

**Tides.**—It is high water, full and change, at Honolulu at 3h. 40m.; springs rise from 2 to 3 feet. The tidal streams are regular, running 6 hours each way, the flood to the westward off the harbour.

**LIGHTS.—Western reef or Front light.**—Near the edge of the western reef of the channel leading into Honolulu harbour, at a distance of  $6\frac{3}{4}$  cables from the outer red buoy in the entrance, stands a lighthouse, painted white, erected on piles, from which, at 26 feet above high water, is exhibited a *fixed red* light, visible 9 miles, between East and N.W. by W. through North, *i.e.*, all round seaward and up the channel until abreast of it, when it becomes obscured.

**Custom-house or Rear light.**—Near the Custom-house, on the eastern side of the harbour, is exhibited, at 47 feet above high water, a *fixed green* light, visible 5 miles. When the electric lights of the town are lighted, which is only during nights when there is no moonlight, this *green* light is electric and at 60 feet above high water.

These two lights are 600 yards apart, and when in line bearing N. 15° E. lead in over the bar, but close along the eastern edge of the dredged channel. They are, however, difficult to distinguish, the *green* light especially, which may at any time be concealed from view by the shipping in port.

**Buoys and beacons.**—The approach to the entrance is marked by a red and white bell-buoy surmounted by a spindle and small black disc as topmark; this buoy lies in 16 fathoms, and is 5 cables eastward of the direct course into harbour. The channel entrance is marked on the western side by a white conical buoy surmounted by a small black disc; the eastern side by a red spar buoy, in shallow water, and by a red can buoy, No. 5, about 100 yards W.S.W. from it and at the eastern edge of the channel. Both of these red buoys have to be left on the starboard hand in entering.

The channel, within the entrance buoys described, is distinctly marked by four red buoys on the eastern side and by eight white piles on the western side; the fourth pile from seaward has a white disc on it.

Three mooring buoys are placed in the harbour to assist vessels in warping away from the wharves.

When a mail steamer is expected, the channel buoys are lighted with lanterns.

**Pilots** usually board vessels between Diamond head and the Fairway bell-buoy, and moor vessels as directed by the Harbour-master; they consider it safe and are always prepared to take in vessels up to 27 feet draught at low water.

Pilotage is not compulsory, but merchant vessels entering or leaving without taking a pilot have to pay half pilotage, and no vessels are entirely exempt except men-of-war and coasters.

The following are the rates charged, the rates in and out being the same. Mail steamers of 1,000 tons and upwards, \$50; other transient steamers, \$75; war vessels, \$2 per foot if pilot taken; sailing vessels under 200 tons, \$1·50 per foot; other vessels and steamers, per ton, 5 cents. For detention of pilot, \$7 per diem is charged.

**Directions.**—When approaching Honolulu from the eastward, the truncated conical crater of Diamond hill, with its lighthouse, comes prominently into view, and is an excellent landmark; but if from northward of Molokai, Koko head is the most prominent landmark. Shape a course to pass at least one mile southward of both or either as the case may be, and when Diamond head is abeam, steer N.W. by W., when the Fairway bell-buoy will soon appear directly ahead. If intending to anchor outside the reef, the best place is in the vicinity of this buoy, as already described.

When approaching Honolulu at night, and intending to anchor outside, use the leading lights in line as a guide, and observe the moment of entering and finally passing through the *red sector* of Diamond head light, as that is a most useful guide to the near approach to the anchorage. Be most attentive to the soundings, obtaining bottom between 30 and 40 fathoms; when in 20 fathoms, haul to the eastward and open the *green* light well eastward of the *red* light to keep clear of the fairway, and when in about 12 fathoms anchor. If the Fairway bell-buoy can be seen, there will be no difficulty in picking up a safe berth near it.

When crossing the bar, as before stated, the deepest water is not found with the leading lights in line, but nearer the western side of the channel, with the harbour lighthouse or red light bearing N. 18° E.; on this bearing, not less than 30 feet will be found at mean low water, the buoys and beacons marking the channel.

Vessels are anchored and the stern hauled in to the ledge north-westward of the lighthouse by means of chains to anchors on the ledge. In the event of a strong southerly breeze rendering it necessary to cast off the stern mooring, an anchor should be dropped under foot before swinging off into the harbour.

Vessels leaving Honolulu under sail, either for the northward or eastward, are recommended to shape course about S.W. for 30 miles or more, before hauling up to the northward, so as to keep in a belt of wind which blows through the *pali* over Honolulu, and leads into the true trade wind. By keeping close inshore, vessels will probably be becalmed for some time; merchant vessels trading between Honolulu and San Francisco generally leave with yards squared, until they pick up the trade clear of the influence of the island.

**Coast.**—From the entrance of Honolulu harbour, the coast trends in a curve about 4 miles S.E. by E., to Leahi or Diamond head, and

is fronted by a coral reef, which extends in some places 5 cables from the shore.

**Leahi** or Diamond hill is an inactive crater with rugged edges, 761 feet high, about half a mile in diameter at its summit, and  $3\frac{1}{2}$  miles S.E. by E. from Honolulu. It is highest towards the water, then slants down and back, and drops suddenly into a low plain extending back to the mountains.

**DIAMOND HEAD LIGHT.**—From a white stone tower 40 feet high on Diamond head, and at 145 feet above high water, is exhibited a *fixed* light, visible 15 miles. The light shows *white* with a *red* sector, thus:—*white* from S.  $83^{\circ}$  W. through North to N.  $89^{\circ}$  E.; *red* from N.  $89^{\circ}$  E. through East to S.  $80^{\circ}$  E.

**Signal station.**—A signal station consisting of a square white building and flagstaff is situated on Diamond hill, about 250 yards eastward of the lighthouse and 120 feet above the sea; from it, all vessels are signalled to the town as soon as sighted.

**Waikiki** is a village with a conspicuous hotel lying about one mile north-westward of Diamond hill; there is anchorage in front of it, which is occasionally used, but not recommended, as the sailing vessels sometimes compelled to bring up there frequently lose their anchors.

**Coast.**—From Diamond head, the land trends away E.N.E. about 7 miles, and then turns southward to Koko head, which lies 6 miles E.  $\frac{3}{4}$  N. from Diamond head, and consists of barren rocky cliffs rising so suddenly from the sea that to all appearance a vessel might pass close to them. The bay between these headlands is apparently shoal and rocky, and the surf breaks violently on the beach, behind which is a lagoon.

Koko head is the most prominent object visible in approaching the island from the eastward, northward of Molokai, and is 644 feet in height; behind it is Koko crater rising to a height of 1,205 feet above the sea level. From Koko head, the coast trends 4 miles N.E. by N. to Makapuu point, the eastern extreme of Oahu island, described at page 221.

**KAUAI**, or Atooi, lies 64 miles W. by N. from Oahu, and is separated from it by the Kaieie Waho channel. This island is of volcanic formation, almost circular in shape, being 28 miles long, East and West, by 23 miles wide, and rises in the centre to Waialeale peak 5,000 feet in height, and the highest point of the island. There is said to be a crater at the summit of this mountain, and from the summit, in clear weather, the island of Oahu can be seen.

Kauai was the first island of the group visited by Cook, in January 1778, and he was much struck by the care with which the natives managed their plantations. From seaward, the N.E. and N.W. sides appear broken and rugged, but to the South the land is more even, the hills rise with a gentle slope from the shore, and at some distance back are covered with wood.

Kauai is considered one of the most pleasant islands of the group; portions of it appear better adapted to agriculture than the other islands, and the coffee and sugar plantations on the weather side, which is well watered with streams and frequent rains, are very productive; the lee side is dry and adapted to cultivation only in the valleys.

**Communications.**—A small steamer carrying the mail leaves Honolulu every Tuesday for Kauai, calling at Nawiliwili, Hanamaulu, Koloa, Eleele, and Hanapepe, and returning to Honolulu on Sunday.

There is no cable communication with other islands, but all the principal towns and plantations on the island are in telephonic communication with each other, the central office being at Lihue, about 2 miles inland from Nawiliwili harbour.

**Makanuena point**, the southern point of the island, is a bold bluff barren rocky headland of moderate height falling perpendicularly to the sea, with a remarkable dome-shaped hill a short distance north-westward of it.

**NAWILIWILI BAY AND HARBOUR.\***—From Makanuena point, the coast trends N.E. 7 miles to Kawai point; this part of the island is well watered, and a heavy sea rolls in on the shore. Kawai point is the southern outer point of Nawiliwili bay, and from it Ninini point, the northern outer point bears N. by E.  $\frac{3}{4}$  E.  $1\frac{1}{4}$  miles.

**LIGHT.**—Ninini point is moderately low, sloping gradually from some low hills a short distance inland; it is fertile ground, and is in fact a sugar plantation. It terminates in bluffs from 30 to 40 feet high. From a white wooden frame-work tower on the South extreme of Ninini point is exhibited, at 70 feet above high water, a *fixed white* light, visible 10 miles.

**Anchorage.**—There is good anchorage tolerably protected from the trade wind with fair holding-ground outside the harbour, in 6 fathoms, off a small sand patch, the only one to be seen, about 400 yards north-westward of Ninini point; the anchorage is a little southward of a line drawn direct between Ninini and Kuku points. To anchor any farther southward than this, a vessel becomes very much exposed.

**Nawiliwili harbour** is the small cove at the head of Nawiliwili bay, within Carter and Kuku points, the two inner points of the bay,

\* See chart No. 1,510; also plan of Nawiliwili harbour, on sheet of plans, No. 1,377.

which lie N.  $\frac{3}{4}$  W. and S.  $\frac{3}{4}$  E. from each other, and are 5 cables apart. The harbour extends about 7 cables eastward from the entrance points, but the greater part is blocked by shoals and reefs.

There is a large village at Nawiliwili, and the soil in the vicinity is rich, producing sugar-cane, taro, beans, sweet potatoes, &c.

Carter point is a high steep bluff with high hills rising immediately behind it to the south-westward. A spit, with from one to 3 fathoms over it, on which the sea always breaks, projects 4 cables from the southern shore near Carter point in a northerly direction, leaving Middle channel, rather more than one cable wide and having a depth of 4 fathoms, between its extreme and Kuku point on the northern shore. This channel leads to the southward, between the spit and the shore reefs, to an inner harbour in the south-western corner of the bay, where there are from 2 to 4 fathoms water.

**Landing.**—There is a substantial wharf in the north-western corner of the harbour, where landing may be easily effected; but it should be approached with caution, as a reef extends 2 cables from the shore in an easterly direction to the southward of it.

**Buoy.**—A red buoy is moored north-westward of Kuku point, off the end of the reef extending from the north-western shore southward of the wharf, as a guide to the wharf.

**Caution.**—Boats, after rounding Kuku point, should stand well northward of the buoy before steering for the landing place, as the reef extends a good deal northward of a line drawn from the buoy to the wharf.

**Hanamaulu bay\*** is 2 miles northward of Nawiliwili; it is small and shallow, shoal water gradually increasing from one foot at the head, where a small stream flows into it, to  $2\frac{1}{2}$  and 3 fathoms abreast of the inner northern point, just inside of which on the northern side is a small boat landing pier. Just inside the southern entrance point is a small space about a cable in extent where a vessel might lie in from  $4\frac{1}{2}$  to 7 fathoms, with shelter from easterly winds, but quite open to the North-east. A small mooring buoy is laid down in this space for the use of the mail steamer.

**Wailua.**—From Ninini point, the coast trends N. by W.  $5\frac{1}{2}$  miles to Wailua, formerly a place of some importance, which stands on a small river of the same name, in a barren sandy spot, though the surrounding district is extremely fertile; the river, in common with all those along this coast, is closed at the mouth by sand banks, but inside it has as much as 20 fathoms water, and is navigable by canoes for several miles.

---

\* See chart, No. 1,510; also plan of Hanamaulu bay, on sheet of plans, No. 1,490.



In 1880, a small steam-vessel was observed secured to a buoy off Wailua, apparently inside a reef, as breakers were observed all around to seaward.

**Coast.**—From Wailua, the coast turns outwards again for 6 miles N. by E. to Kanala point. It appears to be free from outlying dangers, and at one mile from the shore no soundings could be obtained with the hand lead. Sugar-cane is cultivated along this coast in large quantities, especially in the vicinity of Wailua and Kanala point, where there are several sugar factories.

Kanala point, the N.E. extreme of the island, is a low rounded point projecting into the sea from a very remarkable forked hill, which is nearly detached from the rest of the connected mountains of the island.

From Kanala point, the coast trends round in a curve to North and West for 14 miles to Hanalei bay, and has several small villages scattered along it, near the mouths of mountain streams which are closed by sand bars. The land near the sea is flat and very fertile, but soon rises to the mountains behind. The rivers as well as the sea abound in fish.

**HANAIEI BAY,\*** on the northern side of Kauai, is semi-circular in shape, and lies between two conspicuous bluff heads which cannot be mistaken. The eastern bluff is a dark headland about 50 feet high, the termination of a long green ridge gradually sloping upwards inland; a short distance eastward of it are two sandy beaches. Black head, on the western side, is a rough rocky ridge from 15 to 20 feet high, with a green hill just at the back of it.

Na Pali point, just westward of Blackhead, is the termination of some high land which slopes suddenly to the sea; some parts of the slope are jagged with needle-like peaks. There is a small hill at the extreme point which when approaching from the eastward appears as though detached. A reef extends 7 or 8 cables from Na Pali point.

The bay is about one mile wide at the entrance and nearly the same in depth; less than half of this area is anchorage ground, the shores being widely fringed with reef, over which, on the eastern side (opposite the mouth of the Hanalei river and the eastern bluff northward of it), there is a spit carrying about 9 feet water, with detached heads; this spit extends from  $2\frac{1}{2}$  to 3 cables from the beach. On the western side, when inside Black head, the reef is quite as wide. Round the head of the bay is a shelving sandy beach, but here the 5-fathoms line is from  $2\frac{1}{2}$  to 3 cables from the shore. Quantities of fish may be caught with the seine on this beach.

---

\* See chart, No. 1,510; also plan of Hanalei bay, on sheet of plans, No. 1,377.

The bay is easily entered, and tolerably spacious; but completely exposed to winds from north-westward, which are, however, of rare occurrence; but gales from that quarter must send in a very heavy sea.

The town of Hanalei extends round the head of the bay with the Hanalei and Waioli rivers running into the bay on either side of it. The scene from the anchorage is very picturesque; the mountains rise to a height of from 3,000 to 4,000 feet, and the frequent rains cause them to be clothed with verdure from base to summit, with numerous rills coursing down their precipitous sides. The district derives its name (land of rainbows) from the numerous rainbows caused by passing showers.

**Landing.**—In fine weather, the bar of Hanalei river may be crossed by ships' boats at any time of tide, and inside the depth is from 4 to 6 feet, the river being navigable for boats drawing 3 feet for several miles. The best landing is near the Roman Catholic church, a short distance within the mouth of the river, on the northern bank.

**Anchorage.—Depths.**—The roof of the Protestant church, which shows as a white pyramid above the trees, bearing S.E. by S., is a good mark to lead in to the anchorage in Hanalei bay. A depth of 20 fathoms will be found  $1\frac{1}{2}$  miles from the shore, and in the entrance of the bay there are from 7 to 9 fathoms. The anchorage ground in the bay, in fine weather, and in from 5 to 7 fathoms, is fairly spacious, but in bad weather there is only room for about three vessels under the lee of the reef near the eastern point of the bay. A good berth will be found in about 6 fathoms, with the eastern extreme of the bay bearing N. by E.  $\frac{1}{4}$  E., and Black head W.  $\frac{1}{4}$  N.

**Supplies** are plentiful: beef, vegetables, and fruit may be obtained in abundance.\* Water may be procured by sending boats into the Hanalei river, the water being perfectly fresh a short distance from the mouth.

**Coast.**—From Hanalei bay, the coast trends 4 miles westward to Haena point, from thence in a general direction S.W.  $\frac{1}{2}$  W. 9 miles, and then S.S.W.  $8\frac{1}{2}$  miles to Mana point, the western extreme of the island.

The north-western coast of Kauai, forming the district Na Pali, has a very rugged appearance, rising to lofty abrupt cliffs that jut out into a variety of steep rocky points, destitute of both soil and verdure, but terminating in nearly uniform even summits, on which, as well as in the valleys or chasms between them, are small patches of green. Here and there a stream, running from the lofty mountains behind, finds its way to the ocean.

---

See chart, No. 1,510, and plan on sheet of plans, No. 1,377.

\* This report as to supplies is apparently only correct at certain seasons, for when visited by H.M.S. *Wild Swan* in April 1897, no general supplies, fruit or vegetables could be obtained, and the only beef received on board was a present from a plantation 8 miles distant.—LIEUT. S. SLADEN, R.N.

**Mana point**, the West extreme of Kauai, is a long low sand-spit commencing at the foot of a high range of mountains. A reef extends about 5 cables off the point and for several miles on either side of it, besides which there are some outlying rocks.

**Coast.**—From Mana point, the coast trends S.E. by S. 4 miles to Konole point, and from thence E.  $\frac{1}{2}$  S. 5 miles to Waimea, and is everywhere fronted by a fringing coral reef extending some distance from the shore. In 1876, soundings in 6 fathoms were obtained by H.M.S. *Myrmidon*, when off Konole point, whilst running along the coast about 5 cables outside the breakers; on hauling out from the shore, the depth gradually increased. This coast is open and exposed, and a heavy surf rolls in on the beach.

Between Mana point and Waimea, the coast consists of a sandy plain from a quarter of a mile to one mile wide, and 150 feet above the sea; from thence, it rises gradually to the mountains. It has a sunburnt appearance and is destitute of trees, except on the low grounds where the cocoanut tree thrives and bears abundance of fruit. The sea along this shore abounds in fish.

**Waimea bay**,\* on the south-western side of Kauai, by its position should afford one of the best anchorages around the island, except in the months of January and February, when the trade wind is interrupted and south-westerly winds sometimes blow strongly and directly on shore, but it suffers from the disadvantage that when the trade is quite steady from N.E. on the weather side of the island, the height of the land often forces it to follow round the coast; so that off Waimea, at such a time, the wind may be E.S.E. or even S.E., acting obliquely on the coast and raising a heavy surf sufficient to render the anchorage uneasy, and landing impossible.

Waimea village derives its name from a river, which, after a course of about 15 miles, falls into the sea at this place. It is at the eastern end of a long brown barren hill, where it breaks abruptly, forming the Waimea valley. At one time Waimea was a populous native town, but is now only a small village. The growth of the sugar industry is, however, likely to make it again a place of some importance. Boats may ascend the river, when its mouth is not blocked by sand, as is frequently the case, for about three quarters of a mile, and here they may obtain the only water in this vicinity that is not brackish.

**Landing.**—The position of Waimea may be recognised from seaward by the high brick chimneys of the sugar mills at Kekaha to the westward, and Makawili to the eastward. The sugar mill at Waimea has two black iron funnels.

---

\* See chart, No. 1,510; also plan of Waimea bay, on sheet of plans, No. 1,490.

**Anchorage.**—A conspicuous brown church, a short distance up the hill behind the village, kept a little open to the left of the pier-head N.  $\frac{3}{4}$  E., leads up to the anchorage in from  $5\frac{1}{2}$  to 7 fathoms, about 5 cables from the pier-head, or farther out in from 10 to 15 fathoms. The sand is inclined to collect and grow outwards from the shore, so that the pier has had to be lengthened 150 feet, in order to allow of landing at its head, which is by no means good at any time, and often impracticable.

Waimea bay should be approached with caution, as reefs extend southward and W.S.W. from the centre of the bay. On the leading line given, the soundings when obtained decrease gradually and regularly.

About one mile westward of Waimea is the spot where Cook's boat first landed on the discovery of the Hawaiian islands. As far as Cook sounded he found that the bank has a fine gray sandy bottom, free from rocks, except a little eastward of the village, where a shoal projects, on which are rocks and breakers, but not extending far from the shore.

**Makawili.**—This place is about one mile eastward of Waimea, and is formed by a break in the reef leading up to a stone pier, which affords much better landing than at Waimea; the anchorage, in about  $7\frac{1}{2}$  fathoms, 5 cables south-westward from the pier, being also better protected than that at Waimea, so that the small coasting steamers now usually call at this place in preference.

Makawili mill chimney is one of the most conspicuous marks on this coast; it is about  $1\frac{1}{2}$  miles eastward of the anchorage, and is upwards of 200 feet in height.

Makawili bay should be run for with the pier bearing N.E., as H.M.S. *Wild Swan* found as little as 5 fathoms at  $1\frac{1}{2}$  miles off-shore on either side of this bearing.

Captain King also says that in running down to the anchorage off Waimea, from the southern point of the island, he saw the appearance of shoal water in several places at a considerable distance from the land; and when about 2 miles eastward of the anchorage and 2 or 3 miles from shore, he got into  $4\frac{1}{2}$  fathoms water, although the soundings had been usually 7 or 8 fathoms.

**Coast.**—From Waimea, the coast trends S.E. by E.  $5\frac{1}{2}$  miles to Hanapepe, where there is a valley about half a mile wide at the entrance, and decreasing in width as it approaches the mountains; at its head is a beautiful waterfall, though the volume of water is not great. At the foot of this fall, a system of irrigation has been brought into play for the benefit of the land between Hanapepe and Waimea, with the result that the once barren hills and plains of this district are now verdant with plantations of sugar-cane.

In front of Hanapepe, a coral reef commences and stretches some distance to seaward and then along the coast to the westward. At 3 miles eastward of it, the coast consists of reddish coloured bluffs.

**Rock.**—At Wahiawa, 4 miles eastward of Hanapepe, there is a small crater near the beach, and a short distance above it a conical hill. A rock with only 7 feet over it lies about one mile off-shore at Wahiawa.

Between Hanapepe and Kaloa, a distance of 7 miles, the coast consists of a series of sunburnt hills and partially cultivated plains, sloping gradually to the shore from the mountains, here and there intersected by ravines. The greater part of the soil here only produces a kind of coarse grass unfit for pasture.

**Kaloe bay**, about one mile westward of Makanuena, the South point of Kauai, is a slight indentation of the coast, where there is a considerable village of the same name, off which anchorage may be obtained, but in a very exposed position.

The country around Kaloe is much broken by hills and inactive craters; but the soil is good, though dry and very stony, and is capable of cultivation in many places. There is a sugar plantation here, and several large cattle ranches in the vicinity. Near the beach are two inactive craters.

The village may be recognised by many high buildings and two churches, and extends from the beach to a distance of 2 miles up the slope of the hill; also by a low point with a sandy patch on its western side, situated between the village and Makanuena point. From this low point, a rocky ledge extends a short distance, and somewhat protects the anchorage.

There is a good landing place at Kaloe in a small cove protected by a reef extending about one cable from the shore; an artificial creek has been made at the head of this cove, with sufficient space for one boat to enter.

Supplies of beef, vegetables, and fruit may be obtained in abundance.

**Anchorage.**—A berth may be found in about 11 fathoms, sand and shells, with the western church bearing N.  $\frac{2}{3}$  E.; the low point E.  $\frac{1}{3}$  N.; the dome-shaped mountain N.E. northerly.

It may be mentioned that from a position about one mile South of Makanuena, the most western point in view will be observed to have a black lava wall crossing it from East to West, and that the anchorage off Kaloe is about 5 cables westward of this point. This part of the coast appears to be fringed by a rocky ledge, but may be safely passed about one mile distant.

**NIIHAU**, or Oneeheow, lies 17 miles W.S.W. of Kauai, from which it is separated by the Kumukahi channel, and is about 16 miles in length N.E. by N. and S.W. by S., and 7 miles wide.

This island is mostly low land except on the eastern side, where it rises directly from the sea to a height of 1,500 feet, and is rocky and unfit for cultivation. On the western side is a level plain from 2 to 4 miles in width, where the natives cultivate yams, fruits, sweet potatoes, &c. The soil being dry, the yams grow to a great size and are of very good quality. The natives are few in number, very poor, and live almost entirely on the western side of the island.

The eastern coast of Niihau is rocky and wholly destitute of shelter or anchorage; but on the western coast are several open roadsteads where anchorage may be obtained, though very exposed.

**Coast.**—Cape Kawaihoa, the south-eastern point of the island, terminates in a round hill. From here, the coast forms a bight to the north-westward of a line drawn 8 miles N.E. by N. to Pueo point, near the middle of the eastern side, over which point rises the highest peak of the island. From Pueo point, the coast continues to the northward for 6 miles to Oku point, the north-eastern extreme.

**Lenua** or Egg island, off the northern point of Niihau, is a small rugged barren rock, apparently destitute of soil, and without any sign of habitation. It is separated from Niihau by a channel about one mile wide, in which the depth appears to be irregular and, therefore, until more closely examined, it should not be used.

**Coast.**—From the North point of Niihau, the western coast trends in a general S.W. direction 12 miles to Kana point, which is a long low sandy point having a rock 10 feet above water near it, and a reef extending a short distance outside the rock. Off the point, breakers extend nearly  $1\frac{1}{2}$  miles.

**Yam bay** is an open roadstead about  $1\frac{1}{2}$  miles southward of Kana point, where, in fine weather, anchorage may be obtained. The soundings are regular, with a sandy bottom.

There is only one place in the bay where boats can effect a landing with safety when the sea sets in, which is a common occurrence; this is on the northern side, behind a small reef of rocks a short distance from the beach, and even here it is necessary to guard against sunken rocks.

Vancouver anchored here in 18 fathoms, with Kana point bearing N.N.E.  $\frac{1}{4}$  E.,  $1\frac{1}{2}$  miles.

**COOK ANCHORAGE**, on the south-western side of Niihau, is about 4 miles southward of Kana point and is exposed to the heavy north-westerly swell which frequently sets in, and breaks some distance from

the shore; the bottom is composed of large rocks, with patches of sand in some places. Near the beach are a few huts, a church, and a derrick for loading and unloading boats. In 1875, H.M.S. *Peterel* anchored here in 9 fathoms, sand and rock, with Kaula island bearing S.W.; extreme of the reef off Kana point N.  $\frac{3}{4}$  E.; and the church N.E. by E.  $\frac{1}{2}$  E.

**Directions.**—If bound to Cook anchorage from the north-eastward, a vessel should pass northward of Lenua island, and keep along the western shore of Niihau, as the trade wind draws more from the northward on this side of the island.

Lenua island may be rounded within 5 cables, and the western shore of Niihau, which appears tolerably bold, may be passed at a distance of about 2 miles. The reef which extends off Kana point should not be approached nearer than  $7\frac{1}{2}$  or 8 cables, when probably soundings will be obtained in from 13 to 15 fathoms, deepening again to over 20 fathoms after this point is passed. When the huts at the landing-place at Cook anchorage bear E. by N., they may be steered for, the soundings decreasing gradually to 12 and 9 fathoms, and an anchorage taken up in about the berth occupied by H.M.S. *Peterel* as already described.

**Landing.**—The landing-place is protected by some rocks forming a breakwater in the north-eastern part of the bay, and is situated just inside a lava patch, which from seaward appears like a point; landing can be effected easily in moderate weather, but with a heavy swell it is impracticable.

**Supplies.**—Sheep being bred here for the sake of their wool only, very little meat can be procured, and only a limited quantity of vegetables or fruit can be obtained. Fresh water can only be procured during the rainy season, when the watercourses are full; at other times, there is no water but that collected by the natives in wells in the rock for their own use; these wells are chiefly near the southern end of the island.

**Caution.**—As the rollers set in with but little warning at Cook anchorage, sailing vessels should proceed to sea on the first indications of them. On these occasions, fishermen who go out for only a few hours are sometimes unable to land on their return, and have to go round to the other side of the island. The rollers generally last from three to four days.

**Coast.**—From Pahau point, the south-western point of Niihau, the coast, here much indented, trends E. by S.  $3\frac{1}{2}$  miles to cape Kawaihoa.

In 1792, Vancouver anchored off this part of the coast in 14 fathoms, soft sandy bottom, about 7 or 8 cables from the shore; and, with the wind well from the northward, this is not a bad anchorage, as there is not so much swell as on the western side of the island.

---

See chart, No. 1,510.

**KAULA**, or Tahura, lying nearly 20 miles S.W. by W. from Cape Kawaihoa of Niihau, is a small high barren rock, destitute of vegetation and uninhabited. It is visited to collect the eggs of sea-birds which abound here. Landing can only be effected in the calmest weather, as the surf breaks heavily on the shore at all times.

**MODU-MANU\* Nihoa or Bird Island**, of which Miller peak, the highest point of the island close to its western end, is in lat.  $23^{\circ} 34' N.$ , long.  $161^{\circ} 55' W.$ , was discovered on 13th April, 1789, by Captain Douglas of the *Iphigenia*, and lies 116 miles N.W. by W.  $\frac{1}{2}$  W. from Niihau. The existence of this island was unknown to the native inhabitants of the Hawaiian islands.

It is a barren rocky island 903 feet high at Miller peak, 869 feet high at the eastern end, and about 600 feet in the middle; it is only three-quarters of a mile long East and West, and averages less than one third of a mile in width. The northern side is a precipice, as are also the eastern and western ends; but on the southern side is Adams bay, which includes three small bays, of which the two eastern have rocky shores, but the western bay has a sandy beach, reported to be very suitable, if required, for the landing of a telegraph cable, though the central bay affords the best landing.

On this point, Capt. H. J. May, H.M.S. *Hyacinth*, who visited the island in October 1894, states that a confused cross swell from N.E. and South rendered landing difficult; still it was effected without damage to boats or other accident; and with such appliances as are common to the harbourless coasts of these islands, there would probably be no real difficulty in communicating with the South side of the island in almost any weather.

The island is the resort of myriads of sea-birds, which formerly led to the belief that beds of guano might exist; but probably the formation of the rock, together with the large amount of rainfall, prevents any accumulation taking place. The presence of such vast numbers of birds is sufficient to poison any water that might be caught amongst the rocks, rendering it not only unfit for drinking but even for washing purposes.

**Soundings.**—Modu-manu appears to stand on an extensive bank of sand and shells, dead coral, and rock, with a very level bottom, and, so far as examined, quite free from coral heads or other dangers; the general depths are from 20 to 35 fathoms, and the bank was found to extend 14 miles north-eastward and 11 miles eastward of the island. To the southward and westward, the edge of the bank has not been traced. At 5 or 6 cables from the island there are from 12 or 14 to 20 fathoms, all round, and when sounded by H.M.S. *Hyacinth*, the water was so clear

---

\* See chart, No. 782; also plan of Modu-manu, on sheet of plans, No. 2,169.



that any sunken dangers must have been seen had they existed near the shore. The U.S.S. *Yorktown*, in 1897, obtained a sounding of 47 fathoms, rock, with the island bearing S.W. by S. 11 miles.

**Anchorage.**—Off the landing in Adams bay, anchorage may be found in favourable weather within as little as 2 cables from the shore ; from the soundings around the island, however, it appears that temporary anchorage under its lee, according to the direction of the wind, may be found anywhere at about 5 cables from the shore.

#### WESTERN ISLANDS OF THE HAWAIIAN GROUP WITH OTHER DISTANT ISLANDS AND DANGERS.\*

A succession of islands, rocks, and shoals, extend in a long line W. by N. from Modu-mauu, for a distance of 1,350 miles and more. They are seldom visited, and, therefore, many other dangers may yet be discovered in this direction. Before describing this group, it will be well to mention Johnston island and three reported reefs which lie south-westward of this string of islands.

**JOHNSTON or CORNWALLIS ISLAND,**† now recognised as under the sovereignty of the United States, was discovered in 1807 by H.M.S. *Cornwallis*, and named after the captain of that ship ; it was examined in 1859 by Lieutenant J. M. Brooke of the U.S. schooner *Fenimore Cooper*, who landed and obtained good observations to fix its position ; and again in 1892 by H.M.S. *Champion*, whose officers made a sketch survey of the island, and the position as finally determined agrees closely with that given by Lieut. Brooke, the hut selected as the observation spot on the south-eastern corner of Johnston island being in lat.  $16^{\circ} 44' 48''$  N., long.  $169^{\circ} 32' 24''$  W.

It is described as being of the nature of a lagoon island, the reef being about 8 miles long N.E. and S.W., and its edge well defined by breakers at both ends and along its north-western side. On the reef are two islets, the larger, which gives its name to the reef, being the south-western islet, half a mile long E.N.E. and W.S.W., the smaller, called Sand islet, a mere sandbank, about  $2\frac{1}{2}$  cables in diameter, and one mile north-eastward of Johnston island.

Both islands are covered with long grass but no bushes or brush-wood. Thousands of wide-awakes, gannets, frigate birds, terns, and other sea-birds were seen, and the ground was covered with their eggs and young.

\* See Admiralty charts;—Pacific ocean, General No. 2,683 ; N.E. sheet, No. 782 ; N.W. sheet, No. 781.

† See chart, No. 782 ; also plan on sheet of plans, No. 2,867.

Several dilapidated huts and a flat-bottomed lighter were at the S.E. corner of Johnston island, the abandoned remains of a guano company. On the north-western side was a whale-boat in fair condition, supposed to have belonged to the barque *Jacob Hanland*, wrecked on this island on December 26th, 1889. The eastern end of the island is 40 feet above the sea level and on the highest point was a flagstaff 22 feet high.

**Landing** is bad, especially at low water, on account of the sharp coral rocky bottom; boats at that time cannot get within 50 yards of the shore. At high water, small boats can land on the beach near the huts.

**Approach.**—The only safe line of approach is with the eastern end of the large island bearing N.W. by N. On this line, the edge of the reef will be struck in 7 fathoms about 5 miles from the island, with irregular depths of from  $5\frac{1}{2}$  to 12 fathoms until within  $7\frac{1}{2}$  cables of the island. On this line of approach patches of shoal water were seen on both sides with apparently as little as 4 fathoms. It would be prudent always to run in with the sun astern and conning the ship from aloft.

**The Anchorage** is in  $6\frac{1}{2}$  fathoms, from 8 to 10 cables S.E. by S. from the highest part of the large islet. Nearer than this it is dangerous to approach, as there are coral heads coming near to the surface. The anchorage is sheltered from the N.E. trade wind, but is exposed to winds from East round by South to W.S.W. The sea in the vicinity abounds with fish of excellent quality.

**Tides.**—It is high water, full and change, at 3h. 15m.; rise about 3 feet.

**REPORTED SHOAL.**—Mr. F. Herriman, master of the schooner *Novelty*, reports that on May 21st, 1897, with the eastern end of Johnston island bearing W.S.W. 12 miles, or approximately in lat.  $16^{\circ} 49' N.$ , long.  $169^{\circ} 14' W.$ , he obtained soundings in  $5\frac{1}{2}$  fathoms, rocky coral bottom; also that the bottom was visible for half an hour after taking this sounding whilst the vessel ran North 2 miles. Light breakers were seen about 3 miles to the eastward whilst the vessel was passing over the shoal.

**SCHJETMAN REEF.**—Captain Schjetman, of the Norwegian ship *Anna*, reported that on October 19th, 1868, he passed a breaking coral reef, level with the surface, at a distance of half a mile, in lat.  $16^{\circ} 8' N.$ , long.  $178^{\circ} 58' W.$ , which appeared to be about  $1\frac{1}{2}$  miles long North and South, and about half a mile wide.

In 1880, it was searched for but not seen in this or any other position by the U.S.S. *Alert*. It remains charted according to the position originally given, but is marked as "position doubtful."

**KRUSENSTERN ROCK**, discovered by Captain Lisiansky and placed in lat.  $22^{\circ} 15' N.$ , long.  $175^{\circ} 37' W.$ , is stated to have a bank

See chart, No. 782.

around it, stretching North and South about 2 miles, on which the sea broke in one place. Captain R. Suffern, of the barque *Craigierne*, has reported that on June 25th, 1897, his ship was on the exact position assigned to the rock, and though the weather was clear and the sea smooth, no indications of either rock or shoal water could be seen from the masthead. The rock is at present retained on the chart in the position assigned, but is marked "position doubtful."

**FROST BANK.**—This bank was discovered by the ship *E. L. Frost* in 1859, and its least known depth of 12 fathoms lies in approximately lat.  $23^{\circ} 45\frac{1}{2}'$  N., long.  $163^{\circ} 25'$  W., or about 100 miles W. by N.  $\frac{3}{4}$  N. from Modu-manu island. The bank is of considerable extent, and until better known, should be avoided. The U.S.S. *Yorktown* passed over it from West to East on the night of the 14th October 1897, obtaining soundings varying between 63 and 25 fathoms for nearly 8 miles on each side of the 12 fathoms sounding, which appears to be near the centre of the bank. The deepest soundings generally had a bottom of blue mud; the shallower ones varied between the same, grey sand, fine white sand, and rock.

**NECKER ISLAND,\*** annexed to Hawaii in 1895, lies with the observation spot near its western end in lat.  $23^{\circ} 35\frac{1}{2}'$  N., long.  $164^{\circ} 40'$  W.; it was discovered by La Perouse in 1786. It is a small rocky island about 1,350 yards long W. by N. and E. by S., and 250 yards wide; it has four distinct peaks, one near each end and two between them, all four being connected by a ridge; the western peak is 280 feet high, the next 300 feet, the next 280 feet, and the eastern peak 240 feet high. A few dwarf shrubs grow near the summit, and the abundance of sea-birds causes a slight deposit of guano, but there is very little soil.

The sides of the island are all steep; in parts, especially on the South, West, and N.W. sides, as perpendicular as walls, and in parts overhanging the sea from 10 to 20 feet beyond the perpendicular; against these cliffs the sea breaks violently and prevents the possibility of landing anywhere except in East or West cove, on the northern side of the island, divided from each other by a narrow neck of semi-detached rock so situated that the wind which makes it impossible to land in the one may cause moderately smooth water in the other, but it must be remembered that landing anywhere is impossible except in fine weather.

A small detached reef extends 100 yards from the eastern end of the island, and one rock on it is 10 feet above water.

The island is of volcanic origin, and bears unmistakable marks of having been known and visited by an ancient race. A rough pathway extends the whole length of the highest ridge, the island itself being naturally

\* See chart, No. 782; also plan of Necker island, on sheet of plans, No. 2,169.

rugged, uneven, and weather-worn, and at every available spot rectangular platforms have been constructed. One of these platforms or terraces measures 48 feet by 30 feet and several others 20 feet by 8 feet; they are mostly paved with pebbles and small stones, and encircled partly by upended blocks of lava, and partly by low walls 2 feet high and 3 feet thick. A few rough stone idols or images about 2 feet 6 inches in height were also found.

Necker island is surrounded by a bank which extends to the N.E. 19 miles, to S.E. 33 miles, to S.W. 9 miles, and to N.W. 8 miles, with depths of from 14 to 21 fathoms. The edge of the bank is abrupt and slopes suddenly everywhere except on the N.E. side, where the slope is gradual. On the bank, the bottom is of sand and coral; around the edge, at a depth of 30 fathoms, it is live coral, and that depth was almost always marked by the presence of large numbers of sea-birds fishing. The shores of the island everywhere except in East cove are steep-to, there being from 5 to 8 fathoms alongside the cliffs.

**Anchorage** may be found anywhere under the lee of the island, from 4 to 8 cables from the shore, in from 8 or 10 to 15 fathoms. Beyond that distance no dangers or indications of their presence were found anywhere on the bank; but, owing to its great extent, caution should be used in crossing it, as there may be heads or pinnacles not yet known.

**Water.**—Heavy rain showers are frequent, but there is no lodgement of water on the island. In a cave in the eastern end, a few water-drips were found, and the small quantity collected was clear and good. Should the island be utilised as a cable station, a condenser for water supply would be a necessity.

**Fish, &c.**—On passing over the bank, great quantities of fish of excellent quality have been caught with hook and line; but on the occasion of the *Champion's* visit, during 14 days in August and September, only very coarse fish were caught, chiefly cavalli and sharks. A few turtle were seen in East cove.

**Tides, &c.**—The rise and fall of tide is not more than 3 feet, probably less, but no regular observations were made; the current over the bank appeared to run W.S.W. about 2 knots, but for a certain time each day the stream, apparently from tidal influences, became reversed, and set N.E. about one knot.

**FRENCH FRIGATE ATOLL,\*** lying 90 miles westward of Necker island, was discovered by La Perouse in 1786, the day after leaving Necker island, and, like the latter, was annexed by the late

---

\* See chart, No. 782; also plan, No. 1,141.

Hawaiian government in 1895. This dangerous and extensive atoll is crescent-shaped, and on it are islets or sandbanks varyingly reported at from 5 to 16 in number according as the varying conditions of wind and sea may have raised them above or washed them away below the water level, and one principal rocky island; the points of the crescent bear N.W. by W.  $\frac{1}{2}$  W, and S.S.E.  $\frac{1}{4}$  E. respectively from the principal island, and are about 16 miles apart.

The principal island, in lat.  $23^{\circ} 47'$  N., long.  $166^{\circ} 15'$  W., is 180 feet long, 45 feet wide, and 125 feet high, rising to a ridge in the centre, and so steep and rugged as to be almost inaccessible; it may be seen about 8 miles distant, and resembles a brig under sail; from it, the largest sandbank bears N.E.  $\frac{3}{4}$  E.  $6\frac{1}{4}$  miles.

Captain Brooks, of the *Gambia*, visited this island in 1859, but, finding no guano, he left 20 men on the island while he explored the islands to the westward; during the summer months, these men collected seal skins, seal oil, skarks' fins, &c., and subsisted on fish, turtle, fowls, and eggs; water was obtained by digging a well 8 to 10 feet deep on the largest sandbank about 600 yards from the beach; the water, though somewhat brackish, was not unwholesome.

French frigate atoll can only be safely visited between the months of May and September, both inclusive, and, except by a few Japanese schooners in search of shark fins, oil, and turtle shell, is generally avoided. Several wrecks have occurred on the reef, of which the *Daniel Wood* and *South Seamen*, whalers, were lost in 1859, and their crews saved. The *Rebecca* also was lost through mistaking the rocky ridge on the principal island for a ship.

**Anchorage.**—Vessels of any size can approach the principal island within a cable's length, and may anchor in the summer season anywhere inside the reef in from 3 to 14 fathoms. The bottom is composed of coral patches and sand.

**Directions.**—Entering from the southern side, the principal island bearing N. by W. leads between the southern horn and the breakers reported 3 miles westward of it, and when up to the western side of the island, a W.N.W. course leads clear past the N.W. horn. The soundings within the crescent vary between 12 and 17 fathoms, broken shells, sand, and coral; or rock, sand, and coral. There is no danger outside the line of breakers.

**The Current** in the vicinity of the atoll was observed to be running in a south-westerly direction about 2 knots.

**BROOKS SHOAL.**—In 1859, Captain Brooks, after running 30 miles W.N.W. from French Frigate atoll, crossed a bank with

14 fathoms over it, and saw the bottom distinctly. This places the shoal in lat.  $23^{\circ} 52' N.$ , long.  $166^{\circ} 57' W.$

**GARDNER ISLAND**, in lat.  $25^{\circ} 1' N.$ , long.  $167^{\circ} 59' W.$ , was discovered by Captain Allen, of the whaler *Maro*, in 1820. It is an inaccessible rock about 170 feet high and 200 yards in diameter, with a smaller rock close to its south-western extreme, from which a reef extends about 5 cables.

A bank, with from 17 to 20 fathoms water, surrounds the rock, extending westward about 5 miles and S.W. more than 8 miles.

**MARO REEF**, the centre of which is in lat.  $25^{\circ} 27' N.$ , long.  $170^{\circ} 30' W.$ , was also discovered by Captain Allen, about the same time; it is a dangerous shoal about 30 miles in circumference, consisting of small detached patches of coral and sand, covered with breakers, the heaviest being near the north-western end.

At times the breakers are very light, being scarcely distinguishable from sea-caps, so that great caution is necessary when approaching it. In clear weather, it may be seen from aloft from a distance of 5 miles.

The reef is nearly surrounded by a bank on which are soundings of from 10 to 30 fathoms, extending from 2 to 7 miles and deepening gradually from the reef.

The reef is sunken to the westward, where there is good anchorage.

**DOWSETT REEF**.—On the 4th of July 1872, the whaling brig *Kamehameha* struck on a reef about 13 miles south-westward of Maro reef, the centre of which the master places in lat.  $25^{\circ} 13' N.$ , long.  $170^{\circ} 38' W.$ , which position is confirmed by Captain F. D. Walker of the Hawaiian survey.

It extends N.W. and S.E. about 8 miles, and is about 4 miles broad; in some parts the reef is awash and the sea breaks all over it.

**LAYSAN ISLAND**,\* in lat.  $25^{\circ} 45' N.$ , long.  $171^{\circ} 54' W.$ , is a small island about 2 miles long and  $1\frac{1}{2}$  miles wide, 20 feet high, covered with shrubs, with a lagoon 5 cables long and 2 cables wide in its centre.

The island is surrounded by a fringing reef from 3 to 5 cables in extent, outside of which is a bank 5 miles wide, with from 14 to 35 fathoms over it. No dangers exist beyond the line of breakers. Inside the fringing reef there is a narrow boat passage nearly round the island.

Vessels can only visit this island with safety during the season of the N.E. trade wind, i.e., from April to September, both inclusive. Boats may then effect a landing anywhere except on the southern and south-

---

\* See chart, No. 782; also plan, No. 1,141.

eastern sides. Good anchorage may be obtained on the western side, where the reef is close to the shore with several breaks in it; the best is about 5 cables from the S.W. point, in from 8 to 12 fathoms, coral bottom.

Water of tolerable quality may be obtained by digging to a depth of 2 feet. The island abounds in sea-fowl, and eggs of many kinds are abundant. Seal, turtle, and fish are numerous, and easily taken.

On the 15th April 1894, the island was visited by Mr. J. P. Jameson, master and owner of the brigantine *Arvenire*; he found that a tower 50 feet high had been erected, also that there was a large and expensive plant with plenty of stores of all descriptions for the working of guano, but not a living soul on the island, though, in a deck chair near a hut, was the body of a man, who had apparently died about 3 weeks previously, as the last entry in his log-book was dated 20th March 1894. Several horses and a cow were observed straying about on the island. It is said that a company is again working the guano deposit.

**LISIANSKY ISLAND**, lying 113 miles W.  $\frac{1}{3}$  S. from Laysan island, was discovered by Captain Lisiansky, of the Russian ship *Neva*, in 1805. It is a small low coral island, about 3 miles in circumference, 40 feet in height, and overgrown with bushes; the centre is in lat.  $26^{\circ} 0' N.$ , long.  $173^{\circ} 57' W.$

The island is encircled by a reef in patches which, on the western side, is fairly continuous for nearly 7 miles, and forms within it a lagoon  $2\frac{1}{2}$  miles wide, in which there is good anchorage in from 6 to  $3\frac{1}{2}$  fathoms, sand. The principal entrance to the lagoon is marked by two heavy breakers bearing North and South from each another, 7 or 8 cables apart, and about 2 miles West from the island; between these two breakers are several small rocks nearly awash, which may be avoided by conning from aloft; inside the lagoon are a number of scattered rocks, but as the water is smooth they are easily avoided. The best anchorage is about  $2\frac{1}{2}$  cables from the island in 3 fathoms; it is suitable for vessels of about 13 feet draught.

The approach should be made from the North, but with caution, as there are shoal patches; from the southern end a low and dangerous reef extends southward nearly 7 miles, and in moderate weather the breakers on it can scarcely be distinguished from sea-caps. A reef extends  $1\frac{1}{2}$  miles E.S.E., on which the *Neva* struck; in fact this is considered by Captain Walker, who surveyed it for the Hawaiian government, to be one of the most dangerous of these islands, and by no means to be approached except from March to September.

Brackish water, barely drinkable, may be obtained by digging a few feet. Birds, fish, seal, and turtle abound.

**Tides and currents.**—There is a tidal rise and fall of about  $1\frac{1}{2}$  feet, but much influenced by the winds. In the winter months strong north-westerly currents prevail.

**PEARL AND HERMES REEF**,\* lying 145 miles N.W.  $\frac{3}{4}$  W. from Lisiansky island, is an extensive atoll about 40 miles in circumference, 16 miles long East and West, and 9 miles wide, on which are scattered twelve small low islands and islets, forming a crescent open to W.N.W.

This atoll was discovered in 1822 by two whalers, the *Pearl* and *Hermes*, which were wrecked near the eastern end on the same night, within 10 miles of each other.

Inside the lagoon, the only entrance to which is on the north-western side, there is anchorage in from 3 to 15 fathoms, but the islands cannot be approached within 2 miles; the largest island bears E. by S.  $\frac{1}{2}$  S. from the entrance, and is covered with grass and low trees.

The South-east island is in lat.  $27^{\circ} 47' 50''$  N., long.  $175^{\circ} 51'$  W.

**Anchorage.**—There is anchorage outside the reef in from 8 to 12 fathoms; the best is on the north-western side near the entrance, but caution is requisite as no regular survey of these islands has been made.

The reef is steep-to on the eastern side, the 100-fathoms line being within  $1\frac{1}{2}$  cables of the reef; but on the western side the water runs off shoal for a considerable distance to 35 fathoms, and then deepens very suddenly. There are no known dangers outside the breakers.

Seal and turtle are abundant, and quantities of excellent fish may be obtained; fishing schooners from Japan are the most frequent visitors.

**GAMBIA BANK** was discovered by Captain Brooks, of the *Gambia*, in 1859, who stated it to lie about 30 miles W. by N. of Pearl and Hermes reef, with 14 fathoms water over it, and bottom distinctly seen; this places it in lat.  $28^{\circ} 3'$  N., long.  $176^{\circ} 33'$  W.

**MIDWAY ISLANDS**,\* lying 77 miles W.  $\frac{1}{2}$  N. from Pearl and Hermes reef, were also discovered by Captain Brooks, of the *Gambia*, in 1859, who took possession of them for the United States. The atoll, on which are two small islands, was surveyed by Captain W. Reynolds, U.S.S. *Lackawanna*, in 1867, from whom the following information was derived, supplemented by further information from Captain F. D. Walker, of the *Wandering Minstrel*, which vessel was wrecked in Welles harbour on Feb. 3rd, 1887, the crew remaining 14 months on the island before they were rescued by a schooner which had come shark fishing.

The reef encircling Midway islands is 18 miles in circumference and without an opening, except on the western side. At the N.W. point

---

\* See chart, No. 782; also plans of Pearl and Hermes reef, Midway islands, Seward road, and Welles harbour, on sheet of plans, No. 2,169.



is a small patch of breakers, a few detached rocks, and then commences a compact coral wall, about 5 feet high and from 6 to 20 feet wide, which continues for  $4\frac{1}{4}$  miles to the southward and eastward, when it loses its uniformity of surface and presents a line of detached rocks, very little more than awash, for  $2\frac{1}{2}$  miles to the southward; there, off the centre of the eastern island the rocks dip under water, but re-appear 2 miles to the westward, from whence they again show as a continuous wall for about  $4\frac{1}{2}$  miles to the westward and northward, ending there and forming the South side of the entrance to Welles harbour.

This entrance is about  $7\frac{1}{2}$  cables wide, and from its northern side to the north-western rocks there is a bed of coral with from one to 16 fathoms, showing above water in one place, with occasional breakers.

The northern, eastern, and southern portions of the reef are steep-to, to the rocks. The bottom is visible in two places only, near the N.E. and S.E. points, where soundings are shown on the chart.

**Eastern island** is at the south-eastern extreme of the reef,  $1\frac{1}{4}$  miles in length and half a mile wide, from 6 to 15 feet high, and covered with coarse grass and small shrubs; the beach of coral sand is of dazzling whiteness.

**Sand island**,  $1\frac{1}{4}$  miles westward of Eastern island, is  $1\frac{1}{2}$  miles long, three quarters of a mile wide, and 57 feet high; on its summit is a flagstaff. There is very little vegetation on this island, and the glare from the sand is very trying to the eyes.

The observation spot near the south-western end of Sand island is in lat.  $28^{\circ} 12' 22''$  N., long.  $177^{\circ} 22' 23''$  W.

**Welles harbour** is formed by a gap in the coral reef, and is roomy and safe in the summer months, when the N.E. trade blows steadily, but by no means so in the other season, i.e., from October the 1st to the middle of April, when the wind blows constantly between N.W. and S.E., round by West; and as the entrance is open to the westward, and  $1\frac{1}{4}$  cables wide in the narrowest part, a heavy sea then sets into the harbour, making it quite untenable. During this latter season the *Wandering Minstrel*, which was surveying the islands for the Hawaiian Government, was a fortnight before she could effect an entrance, and when once in could not get out, and was eventually wrecked as before stated.

**Bar.—Depths.**—The bar is well within the entrance, and has no swell on it during the trade winds; it has an uneven bottom of coral rock and small sand-holes; its depth varies from 16 to 21 feet, but changes so often and suddenly as to make it unsafe to count on crossing without getting a cast of 18 feet. Inside the bar, which is from  $1\frac{1}{2}$  to 2

cables wide, the depth for anchoring is from 4 to 7 fathoms, white sand. The bar, however, makes the harbour only fit for vessels drawing less than 18 feet; vessels of deeper draught must lie in Seward road, just outside the entrance, picking out a sandy bottom to anchor on.

The lagoon near the centre of the reef is 2 miles long and  $1\frac{1}{2}$  miles wide, with many coral heads having over them from one to 2 fathoms water. Welles harbour is separated from the lagoon by shoal water, one mile in breadth, and as far as could be ascertained, there is no ship passage into it.

**Anchorage.**—On the western side of the atoll, sheltered anchorage during the trade winds may be obtained in from 10 to 13 fathoms, but on a very foul bottom. The best outside anchorage is in Seward road in from 10 to 13 fathoms at the entrance to Welles harbour.

The coral ridge which extends from the north-western end of the reef to the southern wall gives very irregular soundings, having deep fissures between the rocks, and again spaces of sandy bottom; the *Lackawanna* lost both anchors here.

**Directions.**—Steam-vessels, when approaching Midway islands from the eastward, should make Eastern island, and pass round the southern side to the anchorage in Seward road. If coming from the westward, Sand island should be made.

Sailing vessels from the eastward, during the trade wind season (and at no other time can they with safety visit these islands), should keep northward of the reef, and pass round the north-western rocks, so as to retain a fair wind to the anchorage.

**Supplies.**—Fish of many varieties are at times plentiful, and by hauling the seine on the western side of Green island enough may be sometimes caught to supply a ship's company. It was found, however, by the *Wandering Minstrel* that repeated seining soon rendered them very scarce. A few turtle are also found. Curlew, sandpipers, and peewits are the only land birds on the islands.

Water may be procured on both islands by digging from 4 to 7 feet, and, though at first full of impurities, it becomes drinkable after filtration and allowing it to stand; there is reported to be a well of good water on Sand island.

**Tides.**—It is high water, full and change, at 3h. 28m. Springs rise  $1\frac{1}{2}$  feet, neaps one foot. The tides are regular, and in Seward road the flood sets northward and the ebb southward at from one to 2 knots. In Welles harbour the stream always runs out westward, but not with much strength.

**Caution.**—The Midway islands were originally surveyed under the impression that Welles harbour would prove a useful place at which to form

a dépôt for steamship companies. The extreme danger of the harbour during half the year shows that it is quite unfit for any such purpose, and mariners are accordingly cautioned to give these islands a wide berth during the winter season, or from October 1st to the middle of April.

**Bank.**—In 1899, Commander Belknap, U.S.S. *Nero*, reported the existence of a bank, with 82 fathoms over it, south-westward of the Midway islands, in (approximately) lat.  $27^{\circ} 58' N.$ , long.  $177^{\circ} 45' W.$

**CURÉ, KURÉ or OCEAN ISLAND,\*** is an atoll lying 56 miles West of Midway islands, which it closely resembles both in formation and appearance. It consists of Green island,  $1\frac{1}{2}$  miles long and three quarters of a mile wide, and, westward of it, two small islets or sandbanks joined to it and to each other by sandspits; the whole surrounded by a reef somewhat oval in shape enclosing a lagoon, the entrance to which, about one mile in width and shallow, is on the south-western side. The islands are infested by rats.

The atoll is  $14\frac{3}{4}$  miles in circumference and no outlying dangers have been observed.

Green island, in the south-eastern corner of the lagoon, is about 20 feet high, covered with small shrubs, and similar to Eastern island of the Midway islands. Of the two small islets or sandbanks, the western and largest is about 10 feet high, and lies in lat.  $28^{\circ} 25\frac{3}{4}' N.$ , long.  $178^{\circ} 29\frac{3}{4}' W.$

A bank extends round outside the reef to a distance of about one mile from it, with from 20 to 30 fathoms water. The best anchorage is on the western side, near the north-western point of breakers, in from 8 to 12 fathoms, rocky bottom. The U.S.S. *Saginaw* was wrecked on this island on October 29th, 1870, and the British ship *Dunottar Castle* on July 15th, 1886. Captain F. D. Walker states that no vestige of either vessel was ever found. From the appearance of the islands, they must sometimes be visited by severe storms, the sand being thrown into numerous cones and pyramidal heaps.

**MELLISH BANK**, which is placed on the Admiralty charts in lat.  $34^{\circ} 0' N.$ , long.  $178^{\circ} 12' E.$ , and on U.S. charts in lat.  $34^{\circ} 25' N.$ , long.  $178^{\circ} 47' E.$ , is reported to have a depth of 64 fathoms over it, but the position is very doubtful, reports of soundings obtained in this vicinity varying greatly as to position.

---

\* See chart, No 782, also plan of Kuré or Ocean island, on sheet of plans, No. 2,169.

# INDEX.

	Page		Page
Aa-tua-tua bay - - -	164	Angatau island - - -	126
Aetæon group - - -	115	Anna Maria bay, <i>see</i> Taino-hae	162
——— current - - -	116	Antiope reef - - -	46
Adam and Eve point - - -	164	Anu Anuraro island - - -	118
Adams bay, Modu-manu - - -	242	——— Anurunga island - - -	118
——— island, <i>see</i> Ua-pu - - -	156	Aorai peak, Tabiti - - -	61
——— rock - - -	109	Apataki island, passes - - -	138
Adamstown - - -	109	Apateki bight - - -	158
Adventure island - - -	180	Araara pass, Huaheine - - -	88
Aga Kauitai island - - -	112	Arahiri point - - -	67
Ahii island, anchorage - - -	141	Arahuku point - - -	71
Ahunui island - - -	121	Araktehev island - - -	126
Ahurei bay, village - - -	30	Aratika island, caution - - -	136
———, anchorage, directions - - -	31	Archangel island - - -	118
Aifa pass, Tabiti - - -	66	Area village, Rapa - - -	30
———, anchorage - - -	67	Aroa point - - -	83
Aitutaki island, anchorage - - -	44	Arorangi village - - -	39
———, boat passage - - -	45	Artémisi shoals, Tabiti - - -	81
———, tides, supplies, wind - - -	45	Arutua island - - -	139
Aiurua pass, Tabiti - - -	74	Arutunga, anchorage - - -	44
——— mount - - -	74	——— pass, Mission house - - -	45
Aka Maru island - - -	112	Ataiti port - - -	68
Akatau bay - - -	158	Atiheu bay, anchorage - - -	165
Akiaki island - - -	120	Atiu island - - -	42
Alalakeiki channel - - -	215	Atoll, definition of - - -	3
Alau islet - - -	210	Atollon, definition of - - -	3
———, rock near - - -	210	Atooi island, <i>see</i> Kauai - - -	232
Aleales point, mill - - -	199	Atuona village - - -	156
Alenuihaha channel - - -	208	Atupa-atua point - - -	164
Alia point, Hilo - - -	198	Au Kena island - - -	112
Altimaono basin - - -	66	———, beacon - - -	113
Amanu island, tides - - -	123	———, water - - -	114
Amaru village - - -	37	Auan channel - - -	216
American cove - - -	92	Auotu island - - -	43
Amyot bay - - -	137	Aura island, <i>see</i> Kaukura - - -	137
Anaa island, trade - - -	131	Aurora island, village - - -	144
———, anchorage, mirage - - -	132	Austral islands, <i>see</i> Tubuai - - -	32
Anaho bay, anchorage - - -	164	Ava-hiti pass, Vavitaio - - -	34
———, caution - - -	165	———-ino pass - - -	72
Anakena bay - - -	102	———-iti pass, Murca - - -	84
Anapu channel, point - - -	81	———-iti West pass - - -	65
———, caution - - -	81	———-iti East pass - - -	71
Anatonu anchorage - - -	34	Avamoia pass, Huaheine - - -	89
Anchorage island - - -	174	Avamotu pass - - -	85
——— light tower, beacons - - -	175	Avapeibi pass, Huaheine - - -	89
Aneau bay, anchorage - - -	157	———, pilots - - -	89

	Page		Page
Avarapa pass, Murea - - -	85	Brook's shoal - - -	247
Avaroa pass - - -	84	Broom road, Tahiti - - -	53
Avarua harbour, Rarotonga - -	41	Brovaki pass - - -	139
Avatika pass - - -	139, 142	Byam Martin island - - -	121
Avatiu harbour - - -	40	Byron bay, <i>see</i> Hilo - - -	193
Avatoru pass, valley - - -	142		
----- islet - - -	143		
Avera bay, Rurutu - - -	37		
Balguerie cape - - -	152	Cadmus island - - -	115
Balolo - - -	12	Carlskov island, caution - - -	136
Banc brisant - - -	113	Caroline island - - -	169
Barber point, light, soundings -	223	-----, directions, supplies,	
Barclay island - - -	128	-----, climate, winds -	170
Barometer - - -	5	-----, tides - - -	170
Barrier reef, definition of - -	3	Carter point - - -	233
Barrow island - - -	117	Carysfort island - - -	117
Bass islands - - -	28	Centipedes - - -	53
Bastion point - - -	152	Chain island, <i>see</i> Anaa - - -	131
Battery cove - - -	167	Chanal island, channel - - -	168
Bay of Friends - - -	158	Christmas island, passes - - -	181
Beaconage, French uniform system	19	-----, anchorage, land-	
Bedford island - - -	115	-----, ing, supplies -	182
Belcher island - - -	112	-----, water, inhabitants,	
Bellingshausen island - - -	98	-----, tides - - -	182
Beveridge reef - - -	46	Clark bank - - -	167
Bird island, Sandwich group	242	Clerke island - - -	119
-----, Tuamotus - - -	124	Clermont-tonnerre island - -	118
Bishop point - - -	225	Coal, general - - -	19
Black head - - -	225	-----, Honolulu - - -	228
----- rock, Waimea bay - -	222	-----, Papiet� - - -	62
----- rocks, Hana bay - -	211	-----, Rarotonga - - -	41
Bligh island - - -	117	Cockburn island - - -	116
Blonde reef, buoy - - -	199	Cocoanut bay, Eiao island -	167
Blow hole, The - - -	164	----- cove - - -	202
Bluff peak, Aitutaki - - -	44	----- island, rock, Hawaii -	199
Bon repos bay, directions - -	148	----- point, buoy - - -	200
-----, supplies - - -	149	----- or Neei point - - -	206
Bonnard point - - -	155	Collet, Fort - - -	162
Bora Bora island - - -	95	Collie island - - -	112
-----, anchorage - - -	96	Communications, general - -	20
Bordelais strait - - -	151	Comptroller bay, anchorages -	161
Borne island - - -	154	-----, directions, water -	162
Boudeuse pass - - -	79	Cook anchorage, Niihau - -	240
Bougainville harbour - - -	80	-----, directions, supplies,	
Boulard shoal - - -	152	-----, landing, caution -	241
Bounty bay - - -	109	-----, Tahiti - - -	75
Bow island, <i>see</i> Hao - - -	122	----- bay, point, Easter island -	102
Brander islet - - -	142	----- bay, Murea - - -	84
Bray Rock - - -	189	----- harbour, Tubuai Manu -	89
		----- island - - -	181
		----- islands - - -	5, 38-45

	Page		Page
Cook islands, currents, winds	- 38	Des Lanciers island	- 120
— lagoon island	- 120	Diadème mountain, Tahiti	- 57
— point, Kealakekua, light	- 206	Diamond head, hill	- 232
Coral islands and reefs, definitions	- 3	— light	- 232
—, navigation amongst	- 4	— signal station	- 232
—, Marquesas	- 168	Diana shoal	- 189
Cornwallis island	- 243	Disappointment islands	- 127
—, landing, approach,		Distant islands or Tuamotus	- 104
— anchorage, tides	244	Dockyards, &c.	- 20
Coronados island	- 118	Dog island	- 126
Crab rock, beacon	- 75	Dolphin bank, Tahiti	- 56
Crescent island	- 111	Dominica island, <i>see</i> Hiva- <i>oa</i>	- 152
Croker island	- 124	Doubtful island	- 124
Cumberland island	- 121	Dougherty island	- 26
Current, general	- 13	Dowsett reef	- 248
—, equatorial	- 13	Ducie island	- 106
—, North Pacific	- 14	Duff, mount	- 112
—, South Pacific	- 15	Duke of Gloucester islands	- 118
—, amongst island		— York island	- 83
— groups	- 15		
—, in reef and atoll			
— openings	- 16		
—, caution	- 16		
—, Actæon, group	- 116	Earthquake, Kanwalda	- 207
—, Cook islands	- 38	East Ava-iti pass, Tahiti	- 71
—, Fakarava	- 125	— Maui	- 209
—, Fenua Ura	- 98	— Pearl loch	- 224
—, Fiji	- 8	Easter island, <i>see</i> Rapa Nui	- 100
—, French frigate atoll	- 247	Eastern groups of the Pacific	- 3
—, Hawaiian islands	- 196	— island	- 250
—, Hiva- <i>oa</i>	- 154, 156	Ebrill reef	- 110
—, Kingman reef	- 189	Egg island	- 240
—, Malden island	- 180	Egmont island	- 120
—, Marquesas	- 147	Eiao island	- 167
—, Papieté pass	- 60	—, anchorage, water	- 168
—, Pitcairn island	- 110	Eimeo island; <i>see</i> Murea	- 83
—, Raiatea island	- 91	Eleele	- 233
—, Sandwich islands	- 196	Eliza atoll	- 130
—, Society islands	- 52	Elizabeth or Henderson island	- 107
—, Starbuck island	- 178	— Toau island	- 136
—, Tahiti	- 55	Elson island	- 112
—, Tonga islands	- 8	English harbour, Fanning island	- 184
—, Tuamotu archipelago	- 106	—, anchorage, jetty	- 185
Custom-house light, Honolulu	- 230	Ewa plain	- 220
Danger islands	- 176	Faa channel, Tahiti	- 62
— point	- 184	— point, village	- 62
—, shoals	- 185	— -iti river	- 80
Dawahaidi group	- 123	Faanite island	- 132
Deans island, <i>see</i> Rāhiora	- 141	Faaroa bay	- 92
Depths, general	- 13		

	Page
Faarū point - - -	80
Faarūmai pass, valley - -	82
Faatautia - - -	78
Faauo point, Murea - - -	83
Faie bay - - -	82
Faie, mount - - -	52
Fakaina island - - -	126
Fakarava island, caution - -	132
——, dangers, popula- tion, passes - - -	133
——, anchorage, supplies - -	134
——, tides, bank - - -	134
——, current - - -	135
Fakatopatere - - -	139
Fana shoals - - -	81
Fangataufa island - - -	116
Fanning island, produce - -	183
——, coal, population, harbour - - -	184
——, anchorage, jetty, winds - - -	185
——, water, tides - - -	186
Fanui bay - - -	97
Faone pass, valley, anchorage -	78
Faraari point - - -	75
Faratara reefs - - -	73
Faré harbour, village, pass -	82
Faré Mahora point - - -	71
Fareara point - - -	71
Farei hill - - -	62
Fareone islet - - -	85
Farérea pass - - -	88
Faretua, mount - - -	72
Fareute point - - -	57
Fatu Fatu islet - - -	25
—— Hiva island, anchorages -	148
——, supplies, direc- tions, tides, caution - -	142
—— Huku island - - -	156
——, rocks near - - -	156
Fenua Iti, <i>see</i> Takutea - -	43
—— Ura islands - - -	28
——, current - - -	28
Fenuaino islet - - -	73
Filippo reef - - -	180
Five needles rocks - - -	216
Flat island - - -	157
—— rock - - -	102
Flint island - - -	168
Flying Venus reef - - -	171
Ford island - - -	225
Fort Collet - - -	162
—— Halley - - -	133

Fort Taravao	-	-	-	177
Four Crowns island	-	-	-	118
French Frigate atoll	-	-	-	246
—————, a n c h o r a g e,				
			directions	247
—————, current				247
Fringing reef, definition of	-	-	-	3
Frost bank	-	-	-	245
Furneau islands	-	-	-	125
Gambia bank	-	-	-	250
Gambier islands, <i>see</i> Manga Reva	-	-	-	111
Gardner island	-	-	-	248
General remarks	-	-	-	1
Georgian or Society islands	-	-	-	48
Gloucester island	-	-	-	121
Good Hope island	-	-	-	125
Grand Duke Alexander island	-	-	-	174
Great Central reef	-	-	-	92
Green hill, Hilo, beacon	-	-	-	199
——— island	-	-	-	252
Greig atoll	-	-	-	137
Grosse tour, The	-	-	-	154
Gulches	-	-	-	201
Haaio island	-	-	-	93
Haamene valley	-	-	-	89
Haapiti port	-	-	-	85
Haapu bay	-	-	-	90
Haava strait	-	-	-	151
Haavai harbour, passes	-	-	-	89
——— bay	-	-	-	90
Heavini valley	-	-	-	75
Haena point	-	-	-	236
Hagemeister island	-	-	-	138
Haiku	-	-	-	211
Hukaehau bay	-	-	-	166
Hakabau-bay, depth	-	-	-	158
Hakahe-tau bay	-	-	-	157
Hakamarii bight	-	-	-	158
Hakamui bay	-	-	-	158
Haka-paa cove	-	-	-	161
Ilakapa bay	-	-	-	165
Hakapehi village	-	-	-	162
Hakaotu bight	-	-	-	158
Hakatea cove	-	-	-	163
Hakaui cove	-	-	-	163
Halai hill, beacon	-	-	-	199

	Page		Page
Halawa point - - -	218	Hawaii island, volcanoes - -	197
Halley, fort - - -	150	———, S.E. coast -	197-202
Hamene bay - - -	95	———, N.E. coast -	202
Hana bay, <i>see</i> Kapueokaki -	210	———, N.W. coast -	203-206
—— hepu - - -	153	———, S.W. coast -	206-208
—— iapa, supplies, directions -	154	Haymet rocks - - -	28
—— menu - - -	154	Heani peak - - -	152
—— —, anchorage - - -	155	Height islet - - -	152
—— paa-owa - - -	153	Henderson island - - -	107
—— te-kua bay - - -	153	Henua Ataha - - -	163
—— vave, directions, supplies,		Hercheretua island - - -	118
tides - - -	149	Hergest islands, <i>see</i> Marquesas	145
Hanake island - - -	155	—— rock or Motu-iti -	166
Hanaki bay - - -	153	Herriman shoal - - -	244
Hanalei bay, town, river -	235	Hervey islands - - -	43
—— —, landing, anchorage,		Hikeu bight - - -	158
supplies - - -	236	Hikuera island - - -	124
Hanamanioa, cape - - -	210	Hilo bay - - -	198
Hanamaulu bay - - -	234	—— —, reefs, beacon - -	192
Hauamiai village - - -	150	—— —, town, supplies, landing,	
Hanapepe valley - - -	238	buoys - - -	200
—— reef, rock - - -	239	—— —, lights, anchorage, pilotage,	
Hanga Haa cove - - -	161	directions - - -	201
—— Piko - - -	102	—— —, tides - - -	202
—— Roa - - -	102	Hinapuruvi island - - -	93
Hannay bay - - -	160	Hiti atoll - - -	130
Hao island, anchorage - - -	122	Hitiaa - - -	78
—— —, supplies, tides - -	123	Hiva-oo island, Marquesas -	152-156
Hapapani bay - - -	165	Hobron's flagstaff - - -	212
Hapatonu bay - - -	151	Hohoi bay - - -	158
Happaa valley - - -	161	Holt island - - -	128
Haraiki island - - -	124	Honden island - - -	126
Harpe island, <i>see</i> Hao island -	122	Honolu cove - - -	202
Hat islet - - -	159	Honolulu - - -	226-231
Hataivea bay - - -	164	—— —, hospitals, consulate, popu-	
Hatutu island, channel - -	168	lation, trade - - -	227
Houme bay - - -	165	—— —, communications, climate,	
Huami valley - - -	86	supplies, coal, repairs -	228
Havae pass, Tahiti - - -	72	—— —, distances - - -	23
Hawaiian islands - - -	5, 190-243	—— —, patentslip, outer anchorage	229
—— —, general informa-		—— —, harbour, depths - -	229
tion - - -	191, 192	—— —, wharves, time	
—— —, earthquakes - -	192	signal - - -	229
—— —, natives, supplies,		—— —, tides, lights,	
standard time,		buoyage, pilots	230
coal, climate - - -	193	—— —, directions - - -	231
—— —, wind and weather	194	Honunapo village - - -	198
—— —, rainfall - - -	195	Hood island and rocks near -	156
—— —, currents, pilots -	196	Hotopuu bay - - -	93
—— —, islands, &c., west-		Hotu-iti, mount - - -	102
ward of - - -	243	Hotumatuu pass, Tahiti -	68
Hawaii island - - -	196-208	Huabehine island, population, reefs,	
—— —, magnetic attraction -	196	passes - - -	88



	Page
Huaheine island, harbours, passes	88, 89
——— Nui, Iti - - -	88
Hualalai, mount - - -	197
Hue pass, Tubuai - - -	36
Hull islands, Tubuai group - -	37
Humphrey island, <i>see</i> Manahiki -	173
Hurepiti bay - - -	95
Hurricanes, general - - -	11
———, North Pacific - - -	11
———, South Pacific - - -	11
———, Society islands - - -	51
———, Tuamotu archipelago - -	105
———, Tubuai islands - - -	11, 33
 Ile Mavia - - -	37
Introductory remarks - - -	1
Invisible bay - - -	159
Iore-rahi bank - - -	81
—— iti bank - - -	81
Irihonu pass - - -	83
Iruru pass, Raiatea - - -	92
Ieland groups, principal - - -	4
———, Cook islands - 5, 38-45	
———, Hawaiian islands 5, 190-243	
———, Line islands - 5, 169-189	
———, Marquesas - 5, 145-168	
———, Sandwich islands, <i>see</i> Hawaiian.	
———, Society islands - 4, 47-99	
———, Tubuai or Austral islands 4, 32-37	
———, Tuamotu or Low Archipelago - 4, 104-144	
Ivirna village - - -	39
 Jack and Jane point - - -	164
Jacquemart rocks - - -	152
Jaone bay - - -	153
Jarvis island - - -	180
———, landing - - -	181
Johnston island, <i>see</i> Cornwallis -	243
Jupiter breakers - - -	27

	Page
Kaawaloa cove, village - - -	206
———, Cook monument - - -	206
Ka Lae point - - -	197
Kaala mountains - - -	220
Kaalualu bay, landing - - -	197
Kaena point - - -	222
Kahakuloa point - - -	212
Kahoolawe island, shoal - - -	215
Kahuku point - - -	221
Kahului harbour - - -	211
———, beacon, anchorage, tides - - -	212
Kaieie Waho channel - - -	232
Kailua bay, climate - - -	205
———, light, landing - - -	205
Kaiwi channel - - -	219
Kalanao anchorage, Molokai - -	219
——— leper establishment - - -	219
Kalaua point - - -	218
Kalihi entrance - - -	226
Kaloa bay, village, landing - -	239
———, anchorage - - -	239
Kamaka island - - -	112
Kamalalaea bay, supplies - - -	426
———, anchorage, landing - - -	214
Kamalo harbour - - -	218
Kana point, rock, reef - - -	240
Kanahana point, light - - -	210
Kanala point - - -	235
Kaoio point - - -	221
Kapueokahi or Hana bay - - -	210
———, rocks, depths - - -	210
———, directions anchorage - -	211
Katin island - - -	130
Kauai island - - -	232-239
———, communications - - -	233
———, S.E. and East coasts 233-235	
———, North and N.W. coasts 235-237	
———, S.W. coast - - -	237-239
Kaualahu caves - - -	221
Kauehi island - - -	135
Kauhola point, light - - -	202
Kauiki head, peninsula - - -	210
Kaukura island - - -	137
———, passes - - -	138
Kaula island - - -	242
Kaunakakai, anchorage, harbour -	217
———, depths, lights - - -	217
———, directions, tides - - -	218
Kawai point - - -	233
Kawaihae bay - - -	203
———, light, reef - - -	204

	Page		Page
Kawaihae, anchorage, caution sup- plies - - -	204	Laeloa point, soundings - - -	223
Ka'waihoa, cape - - -	240	Lagoon island, Bligh - - -	117
Keahola point, Hawaii - - -	205	Lahaina, roads - - -	212
Kealaikahiki point - - -	215	——, anchorage, depth - - -	212
Kealakekua bay, light, depth - - -	206	——, light - - -	213
——, anchorage, direc- tions, landing -	207	——, directions, supplies, tides -	213
——, supplies, earth- quake - - -	207	Lahaialuna - - -	213
Ke-au-o-Kanewa - - -	208	Lahilahi rock, point - - -	223
Keauhou bay - - -	206	Lanai island - - -	216
Keawemoe light - - -	201	Laupahuhu light - - -	202
Kekaha mill - - -	237	Lava point, Hawaii - - -	206
Keokea point - - -	198	Lawson bank - - -	167
Keoneveo bay - - -	210	Laysan island - - -	248
Kilauea volcano - - -	197	Lazarev atoll - - -	143
King George island, <i>see</i> Tahiti	52	Leahi hill - - -	232
—— islands - - -	139	Leeward group, Society islands -	48
——, supplies - - -	140	Lelewi point - - -	198
Kingman reef, current - - -	189	Lenua island - - -	240
Kings atoll - - -	136	Lihui village - - -	233
Kitty point, jetty - - -	185	Line islands - - -	5, 168-189
Kohala mount - - -	202	Lisiansky island - - -	249
Koko head, crater - - -	232	Lord Hood island - - -	115
Kolakole peak - - -	209	—— Howe island - - -	98
Kona village - - -	206	L'Orne bank - - -	27
Konahaunui range - - -	220	Los Magos islands - - -	190
Konole point - - -	237	—— Monges - - -	190
Kopoapiro reef, beacon - - -	134	Low Archipelago, <i>see</i> Tuamotus 5, 104-144	
Krusenstern island - - -	143		
—— rock - - -	244		
Kuku point - - -	233		
Kula district - - -	202	Maalaea village - - -	214
Kumukahi, cape, current - - -	198	Mackerrey village - - -	214
—— channel - - -	240	Macy's grave, pyramid beacon -	204
Kurateke island - - -	117	Magdalena island, <i>see</i> Fatu-hiva -	148
Kuré island - - -	253	Magnetic attraction, Hawaii - -	196
Kutuni point, Rapa - - -	31	Maha Honu pass, Tahiti - - -	82
		Mahaena pass, Tahiti - - -	80
		—— village, church - - -	79
		Mabaitea point - - -	66
		Mahea islet - - -	95
		Mahire valley - - -	72
		Mahoti reef - - -	56
		Mahua village - - -	35
		Mahuia village - - -	34
		Maina island - - -	44
		Maio-iti island - - -	87
		Maita island, supplies - - -	52
		Makahannaloa point - - -	201
		Makannena point - - -	238
		Makaohuli point - - -	208
		Maka-pu island - - -	112
La Desgraciada - - -	190		
—— Magdalena island - - -	190		
—— Mesa island - - -	190		
—— Perouse bay, Easter island	102		
—— mount - - -	101		
Lae-o-ka-Ilio - - -	219		
—— Laau light - - -	217		
Laeloa point, light - - -	223		

	Page		Page
Makapuu point, Oahu - -	221	Marquesas, winds, current, directions -	147
Makaroa island - - -	112	-----, pilots, supplies - -	148
Makatea island, village - -	144	Marsh island - - -	112
Makawili, bay, chimney - -	238	Martin, cape - - -	161
Makees landing - - -	214	Marua island, pass, depths - -	97
Makemo island, passes, supplies -	129	Marutea island - - -	115
-----, tides, caution - -	129	----- islands - - -	125
Makena - - -	214	Masse island - - -	167
-----, anchorage, buoys - -	215	-----, anchorage, water - -	168
Makuhona, village, anchorage -	202	Mata-orio point - - -	79
-----, buoys, beacon - -	203	Matahai village - - -	135
-----, light - - -	203	Matahiva island - - -	143
Maldon island - - -	178	Mataiea - - -	67
-----, climate, winds, an-		Matariuna anchorage - - -	137
----- chorage - - -	179	Matau cape, rock off - - -	158
-----, landing, coal, current	180	Mataura village, Tubuai - -	35
Mana point, Kauai - - -	237	-----, anchorage - - -	35
Manahiki island, village - -	173	Matauvau pass, anchorage, Murea -	85
-----, seismic wave - -	173	Matavai bay - - -	56
Manga Reva island - - -	112	-----, anchorage, directions -	56
----- islands - - -	111	Matavera village - - -	39
-----, population - - -	111	Matai island, village - - -	144
-----, wind and weather - -	112	Matira point - - -	97
-----, caution - - -	112	Matotea mount - - -	80
-----, passes, depths - -	113	Matu pass, Tahiti - - -	69
-----, anchorages, water - -	114	Matuhu bank, beacon - - -	69
-----, pilots, tides - - -	114	Matunga islet - - -	172
Mangaia island - - -	38	Maturei Vavao island - - -	115
-----, communications, supplies -	39	Mau Fenua peak - - -	92
Mangorongo island - - -	171	Maui island - - -	208-215
Manihi island, pass, anchorage -	140	-----, general aspect - - -	209
Manino pass - - -	181	-----, South coast - - -	210
Manuai island - - -	43	-----, N.E. coast - - -	210-212
Manuhangi island - - -	121	-----, S.W. coast - - -	212-215
Manui island - - -	112	Mauki island - - -	41
Maomao point, beacon - - -	81	Mauna Haleakala - - -	209
Mapeti island - - -	67	----- Ika, mount - - -	209
Maraa pass, point, Tahiti - -	65	----- Kaala - - -	223
-----, anchorage, barrier reef	65	----- Kea - - -	196
Maraetiria point - - -	73	----- Loa - - -	197
Marchand island, <i>see</i> Nukuhiva -	160	Maupiti island, <i>see</i> Marua - -	97
Maretiri islands - - -	28	Mbukuola island - - -	199
Margaret island - - -	118	Mebetia, <i>see</i> Maitea - - -	52
Maria island - - -	115	Melbourne island - - -	115
----- Theresa reef - - -	27	Mellish bank - - -	253
Maro reef - - -	248	Melville island - - -	124
Maroe bay - - -	88	Mésange point - - -	165
Marokau group - - -	123, 124	Middle channel - - -	234
Marokupenga village - - -	131	----- ground, Hana bay - -	210
Marquesas, The - - -	5, 145-168	----- Pearl loch - - -	224
-----, general remarks - -	145	Midway islands - - -	250
-----, population, government,		-----, winds, anchorages,	
communications, climate	146	directions - - -	251

	Page		Page
Midway islands, supplies, tides, caution - - -	252	Motukovata island - - -	176
Miller hill, East Maui - - -	213	Motupuapua pass - - -	131
—— peak, Modu-manu - - -	242	Motutunga island - - -	130
Miloradowitch island - - -	132	Motuua bay - - -	153
Minerva or Ebrill reef - - -	110	Montuura pass, village - - -	133
Minto island - - -	115	Mowee island, <i>see</i> Maui - - -	208
Mirimiri point - - -	94	Muaputa, mount - - -	83
Missions - - -	20	Mumuku - - -	204
Mitiéro island - - -	42	Murea channel - - -	86
Mitirapa bay - - -	69	—— island, products, tides - - -	83
—— bridge - - -	70	——, anchorages, reefs, passes - - -	83-86
Modu-Manu island, soundings - - -	242	Muroa mount - - -	-
——, anchorage - - -	243	Mururoa island, passes - - -	116
Moerenhout island - - -	115	——, anchorage - - -	117
Mokapu peninsula - - -	221	Mutu Nui - - -	102
Moku Manu rocks - - -	221	—— Raukau - - -	102
Mokuo Niki islets - - -	218		
Moller island, tides - - -	123		
Molokai island - - -	216, 219		
——, lights, caution, harbours, depths, directions, tides - - -	217, 218		
——, leper establishment - - -	219	Nu Pali point, reef - - -	235
——, Penrhyn - - -	172	—— district - - -	236
Molokini island - - -	215	Naa-o he bay - - -	153
Mopehá island - - -	98	Nairsa island, <i>see</i> Rahiroua - - -	141
Mopelia island - - -	98	Nansquty islet - - -	79
Morane island - - -	115	Nanualele point - - -	210
Morotoi island, <i>see</i> Molokai - - -	216	Nao Nao pass, island, Raiatea - - -	93
Motane island - - -	150	Napuka island - - -	127
Motaukuii island - - -	157	Napupu point - - -	206
Motikitiu island - - -	44	—— village - - -	207
Motu Ahi - - -	86	Nassau island - - -	177
—— Araara - - -	88	Natikitea village - - -	43*
—— Au island - - -	56, 82	Natipa village - - -	43
—— port - - -	82	Native populations, general - - -	20
—— Haané - - -	160	Naval dockyards and establishments - - -	20
—— hi bay - - -	166	Nawiliwili bay, harbour - - -	233
—— Iti or Poiku rock - - -	164	——, light, anchorage - - -	233
—— or Tubuai - - -	97	——, landing, caution - - -	234
—— or Hergest rock, soundings - - -	166	Necker island - - -	245
—— or Nukuhiva - - -	164	——, anchorage, tides - - -	246
—— Nono pass, islet - - -	77	Needle rock - - -	102
—— Pahare - - -	89	Neef or Cooauat point - - -	206
——, Papa islet - - -	160	Neilson reef - - -	32
—— Pehue - - -	86	Nengonengo island - - -	121
—— Puuru - - -	79	New York island, <i>see</i> Washington - - -	186
—— tabu pass, point - - -	92	Ngaruae pass - - -	133
—— Teheri - - -	62	Ngatangua village - - -	32
—— uta island - - -	61	Niau island - - -	137
—— Vavara - - -	89	Niaurau village - - -	43
Motukoe island - - -	176	Nigeri atoll - - -	125

	Page		Page
Nihiru island - - -	123	Oputotara islet - - -	79
Nihoa island - - -	242	Orepa pass - - -	137
Niihau island - - -	240	Orofere valley - - -	64
Nimrod islands - - -	26	Orohena, mount - - -	53
Ninini point, light - - -	233	Osnaburg island, <i>see</i> Mururoa - - -	116
North cape, Easter island - - -	101	Otaheite island, <i>see</i> Tahiti - - -	52
N.E. pass, Penrhyn - - -	172	Otaho pass - - -	131
N.W. pass, Penrhyn - - -	172	Otiaroa point - - -	67
Nouvelle Cythère, <i>see</i> Tahiti - - -	52	Otuni pass - - -	137
Nukuao village - - -	42	Otutara channel, Tahiti - - -	67
Nukuhiva island, Marquesas - 160-166		Owhyhee, <i>see</i> Hawaii - - -	196
-----, aspect - - -	160		
-----, productions - - -	161		
-----, harbours, coast, &c. - - -	161-166		
Nukutavake island - - -	120	Pacific ocean, discovery of - - -	2
Nukutere point, Rapa - - -	31	-----, Eastern groups; general remarks on - - -	4
----- village, Mitiero - - -	42	Paea village, Tahiti - - -	64
Nukutipipi island - - -	118	Pabau point - - -	241
Nuuanu Pali - - -	221	Pahia, mount - - -	96
----- valley - - -	227	Pailolo channel - - -	216
Nuupere point - - -	86	Paipai pass - - -	95
		Pakaka pass - - -	138
		----- village - - -	139
		Pakua pass, Manihi - - -	140
Oahu island - - -	220-232	Pali of Nuuanu - - -	221
-----, general description - - -	220	Palm point, reefs - - -	188
-----, N.E. coast - - -	221, 222	Palmerston island - - -	45
-----, N.W. coast - - -	222, 223	-----, anchorage, passes - - -	46
-----, South coast - - -	223-232	Palmyra island - - -	187
Oatava island - - -	93	-----, reefs, anchorage - - -	188
Obelisk or Sugar-loaf island - - -	157	-----, landing, wind, supplies, tides - - -	188
Observatory islet, Palmyra island - - -	187	Panao pass, village - - -	138
Ocean or Kuré island - - -	252	Paopao bay, Murea - - -	84
Oeno island - - -	110	Papakena island - - -	117
Ofti atoll - - -	130	Papara - - -	65
Oheteroa island, <i>see</i> Rurutu - - -	36	Papatea point - - -	89
Ohiri peak - - -	95	Papawa harbour - - -	57
Oku point - - -	240	Papeari harbour, Tahiti - - -	68
Okukina - - -	139	Papeivi pass, Tahiti - - -	78
Olowalu point - - -	213	----- ravine - - -	77
Omoa bay, <i>see</i> Bon Repos - - -	148	Papenu pass, point - - -	82
Omoko village - - -	172	Papetoai bay, Murea - - -	84
Oneeheow island - - -	240	-----, anchorage - - -	85
Oneroa point, Tahiti - - -	67	Papeuriri bay - - -	67
----- village, Mangaia, landing - - -	39	Papieté harbour, Tahiti - - -	58
Onoheha pass - - -	81	-----, trade, consul - - -	59
----- valley - - -	80	-----, pass, depths - - -	59
Ootua peak - - -	152	-----, currents, marks - - -	60
Oparo island, <i>see</i> Rapa - - -	23	-----, lights - - -	60
Opeha point, reef, buoy - - -	93	-----, directions, weather - - -	61
Opunhu plantation - - -	84		

	Page		Page
Papiet6 harbour, hospital - -	61	Poatuaho point - - -	86
-----, repairs, coal, supplies	62	Poiku rock - - -	164
-----, winds - - -	55	Pokumaru, mount - - -	29
Paraoa island - - -	121	Popeiha valley - - -	78
Paratahi bank - - -	78	Popote bay, Tahiti - - -	66
Pari point - - -	95	Port Ataiti - - -	68
Paroa point - - -	85	----- Beaumanoir, Tahiti - - -	72
Passages between America and the		----- Bourayne, Huahine - - -	90
Pacific islands - - -	21	----- Haapiti, Murea - - -	85
----- the various groups		----- Motu Au, Tahiti - - -	82
of islands - - -	21	----- Paui - - -	68
----- Magellan strait or		----- Phaeton, Tahiti - - -	69
cape Horn and		-----, passes, beacons - - -	69
the islands - - -	22	-----, anchorage, caution - - -	70
----- Sydney or Well-		----- Pihaa, Tahiti - - -	76
ington and		----- Pueu, Tahiti - - -	76
Tahiti - - -	22	----- Rikitea - - -	111
----- Tahiti and Hono-		-----, village - - -	112
lulu - - -	23	----- Tai-oa - - -	163
----- Fiji and Honolulu	23	----- Tematoc, Tahiti - - -	79
----- Yokohama and		----- Toanoano - - -	72
Honolulu - - -	23	----- Vaiau - - -	72
Pataia point - - -	95	----- Vairao - - -	71
Patoa roads - - -	213	----- Vaitoare, Tahiti - - -	78
Patrocino island - - -	253	Portland bank - - -	110
Pau Olai - - -	215	Portsmouth point, Palmyra island -	187
Paukaa point, light - - -	201	Predpriatie island - - -	126
Paumea bay - - -	158	President Thiers reef - - -	32
Paumotu, <i>see</i> Tuamotu - - -	104	Prince William Henry island -	121
Peacock island, <i>see</i> Ahii - - -	141	Principal island groups - - -	4
Peard island or Manga Preva -	112	Puamau bay, anchorage - - -	152
Pearl and Hermes reef, anchorage -	250	-----, landing, supplies - - -	153
----- lochs, river, bar - - -	224	Puheva pass, village - - -	129
-----, description, depths - - -	225	Pueo point - - -	240
-----, anchorage, tides, winds	226	Pucu port - - -	76
----- city, peninsula - - -	225	-----, village - - -	75
Penguin spit, Palmyra island -	188	Pufau bay - - -	94
Penrhyn island, <i>see</i> Tongareva -	171	Puforati channel - - -	72
Perahu mount - - -	29	Puka Puka or Hondon island -	126
P6rigot bay - - -	152	-----, Dauger islands - - -	176
Peterel point - - -	207	----- raro - - -	120
Phaeton port - - -	69	----- runga - - -	120
----- shoal - - -	64	Pukarua island - - -	119
Philip island, <i>see</i> Makemo - - -	129	Puku harbour, lights, tides -	218
Pierre Bonhomme - - -	148	Puua Pau - - -	103
Pihaa point - - -	75	Punaavia bay, point, blockhouse -	64
----- port - - -	76	-----, anchorage, shoals - - -	64
Pin rocks - - -	210	Punnaeroa pass - - -	93
Pinaki island - - -	119	Punahou station, Honolulu -	194
Pitcairn island - - -	107	Punaluu road - - -	198
-----, description - - -	108	-----, lights, village - - -	193
-----, anchorage, landing -	109	Punaru valley, river - - -	63
-----, supplies, winds, current	110	Punch Bowl hill - - -	220

	Page		Page
Puniu reef, beacons - - -	133	Raraka island - - -	135
Punta Roa - - -	102	Raroia island, supplies, current -	128
Puowina hill - - -	227	Rarotonga island - - -	39
Pupu river - - -	82	-----, anchorage, tide -	40
Purauti mount - - -	93	-----, coal, supplies -	41
Pururu islet - - -	67	Rauraia point - - -	80
Putaiano point - - -	79	Rautirare pass - - -	67
Putete point - - -	93	Rautoanui pass, beacons - - -	94
Puuloa river, <i>see</i> Pearl river -	224	Ravahere group - - -	123
----- village - - -	224	Ravaivai island, <i>see</i> Vavitaio -	33
Puuaretu, mount - - -	89	Reao island - - -	118
Pau-ohau crater - - -	207	Reddish islet - - -	157
Puutohe pass, Tahiti - - -	72	Reef (doubtful) - - -	189
		Regent point - - -	92
		Reid atoll - - -	130
Queen Charlotte island - - -	120	Reirson island - - -	173
----- Emma's house - - -	224	Reitoru island - - -	124
		Rekareka island - - -	125
		Repairs, &c., general - - -	20
		Resolution bay, <i>see</i> Vaitaha -	150
		----- island - - -	125
		Revolution, îles de la - - -	145
		Rikiriki bank - - -	129
		Rikitea port - - -	114
		----- village - - -	112
Raeffsky islands - - -	130	Rimitara island - - -	37
Rahiroa island, current - - -	141	Riri point - - -	71
-----, passes - - -	141, 142	Roggewein, cape - - -	101
-----, anchorage - - -	142	Romanzov island - - -	139
-----, caution, dangers -	143	Roniui, mount - - -	53
Raiatea island - - -	90-94	Rotoava anchorage - - -	134
-----, population - - -	90	----- village - - -	133
-----, currents, tides -	91	Rotui, mount - - -	83
-----, harbours, passes -	91-94	Roue reef - - -	71
Rainbow waterfalls - - -	200	Round hill - - -	215
Raiurua bay, anchorage - - -	34	Rurick island - - -	139
Rakahanga island - - -	173	Rurutu island, supplies - - -	36
Rana Hana Kana - - -	101	-----, anchorage - - -	37
----- Kao - - -	102		
Ranai island - - -	216	Sail rock, Nukuhiva - - -	161
Rangiroa, <i>see</i> Rahiroa - - -	141	Saken island - - -	130
Rapa Iti - - -	31	Sala y Gomez island - - -	103
----- Nui island, <i>see</i> Easter island -	100	-----, tides - - -	103
-----, population, anti-		San Pablo island - - -	118
quities - - -	101	----- Pedro island - - -	150
-----, landings, anchorage	162	Sand island, Midway islands -	251
-----, supplies, water,		----- islet, Johnston island -	243
winds, tides -	103	Sands or Hull islands - - -	37
----- island or Oparo - - -	28	Sandwich islands - - -	5, 190-243
-----, productions, winds, an-		-----, general -	191, 192
chorage - - -	39	-----, earthquakes -	192
-----, depths, directions, pi ots	51		
-----, water, tides - - -	32		
Rapae point - - -	73		



	Page		Page
Sandwich islands, natives, supplies, standard time, coal, climate	193	Tahaa village, passes, anchorage	96
—, wind, weather	194	Tahanea island, passes	131
—, rainfall	195	Tahara, mount	56
—, currents, pilots	196	Taharoa pass, bay	76
Santa Christina or Tau-ata island	150	Taharuu river	66
Saunders island	87	Tahire reef	71
Sawle point, reefs	188	Tahiti island	52-82
Schjetman reef	244	—, products, communica- tions	53
Schooner passage	138	—, trade, population	54
Seilly islands, <i>see</i> Fenua Ura	98	—, local winds	54
Scorpions	53	—, currents	55
Scott reef	103	—, Venus point, light	55
Sentinel islands, East and West	62	—, Papieté harbour	58
Serle island	119	—, N.W. coast	62
Seward road	251	—, West coast	63-65
Sha-nahe bay	153	—, South coast	66-72
Shavay bay, anchorage	159	—, East coast	73, 74
Soatoï reef, beacon	60	—, N.E. coast	75-81
Society islands	4, 47-99	—, North coast	82
—, general information	47	— peninsula	52
—, position, climate	49	Tahu-nahoe island	94
—, winds	50	Tahura island	242
—, hurricanes	51	Tahurowa island, shoal	215
—, currents, tides, beaconage	52	Tai-oa port	163
Soundings, general	13	— o-hae bay, light, directions	162
South island, Transit pier	170	—, anchorage, supplies, tides	163
— Summit mountain	94	Taiarapu peninsula, Tahiti	52
— West Cape, Easter island	101	Taiarii point	85
Spreckelsville	211	Taiaro island	136
St. Paul point	109	Taipahia bay	79
— Quentin island	124	Taipari pass	64
— Simon island	125	Taipei valley	161
Starbuck island	177	Taitu, mount	35
—, current	178	Takapoto island	139
Strawn island, Palmyra island	187	Takaroa island	139
Sugar-loaf or Obelisk island	158	Takume island	127
Suvárov islands	174	Takutea island	43
—, pass, beacons, di- rections	175	Tamarua village	39
—, tides	175	Tamarutofa, mount	85
Suwarrow islands, <i>see</i> Suvárov	174	Tanga mount, Rapa	31
		Taomaro pass	24
		Taou islet	91
		Taota pass	85
		Taotoi pass	85
		Tapacrao reef, beacon	134
Taa-hu-ku bay, fort, anchorage	155	Tapahi hill, blockhouse	82
—, landing, supplies	156	Tapioi, mount	94
—, current	156	Tapueraha pass, Tahiti	70
Table of trade wind limits	24, 25	—, directions	70
Taenga island	128	Tapui island	51
Tahaa island	90, 95	Tara vai island	112
— pass	92		



	Page		Page
Taravao bay - - -	- 77	Temperature of sea, general - -	- 12
----- fort - - -	- 77	Tenape point, beacons - -	- 94
----- isthmus - - -	- 68, 77	Tenararo island - - -	- 115
----- pass - - -	- 78	Tenarunga island - - -	- 115
Taro, definition of, culture	- 33	Tenoeroa-haaoa bay - - -	- 95
Tatakoto island - - -	- 119	Teopape point - - -	- 89
Tatikaveka village - - -	- 39	Tepee point - - -	- 85
Tau Ata island, supplies - -	- 150	Tepoto atoll - - -	- 130
-----, anchorages - 150, 151		Tepuka village - - -	- 172
-----, landing, water - 151		Teputo pass, Tahiti - -	- 69
Tauri island - - -	- 125	Teraé anchorage - - -	- 34
Tauna island - - -	- 31	Terehe village - - -	- 65
----- rock - - -	- 137	Teriu bay, Murea - - -	- 84
Taunoa channel - - -	- 58	Teruafaroa point - - -	- 79
----- harbour, pass - -	- 57	Teruapuu pass, Murea - -	- 86
-----, beacons, anchorage	- 58	Tetamanu village, pass - -	- 134
----- reef - - -	- 60	Tetaro island - - -	- 91
Tautira bay, Tahiti - - -	- 75	Tetautua village, islet - -	- 132
----- point, village - -	- 74	Tetiaroa atoll - - -	- 87
Tchichagov atoll, <i>see</i> Tahanea	- 131	Tetobe pass - - -	- 34
Te Atu Kura - - -	- 39	Tetopoto island - - -	- 127
— Ava piti pass - - -	- 91	Tetoroa bay - - -	- 94
— oho-te-Kea - - -	- 161	Teuaua islet - - -	- 159
— pito fenua - - -	- 101	Thisbé anchorage - - -	- 91
Teamahama point - - -	- 95	Thomasset rock - - -	- 149
Teapaa bay - - -	- 90	Thrum Cap island - - -	- 120
Teava Moa pass - - -	- 93	Tiahura islet - - -	- 85
Teachoa point - - -	- 155	Tiano pass - - -	- 94
Teahupu village - - -	- 71	Tiare pass, Huaheine - -	- 89
Teaua point - - -	- 68	Tiere islet - - -	- 73
Teava moa pass - - -	- 93	Tiitau pass, point, patch - -	- 76
----- beacons, anchorage -	- 96	Tikapo, cape - - -	- 161
-----, pilots - - -	- 97	Tikehau island, village - -	- 143
Teavaraa pass - - -	- 66	Tikei island - - -	- 139
Teavarua harbour, Raiatea -	- 91	Timoe island - - -	- 111
-----, depth - - -	- 91	Tiokea island - - -	- 139
-----, supplies - - -	- 92	-----, anchorage, supplies -	- 140
----- pass - - -	- 91	Tipareui brook - - -	- 60
Tehau point - - -	- 85	Tipute pass, village - -	- 142
Tehavaroa pass, village - -	- 139	Tiva point - - -	- 88
Tehere pass, Apataki - - -	- 139	Tivaru pass - - -	- 141
Tehuaro to islet - - -	- 73	Ton Tea reefs - - -	- 56
Teiehe peak - - -	- 74	Toahiva bay - - -	- 93
Tekarae point, Rarotonga - -	- 40	Toahotu pass, islet - - -	- 95
Tekokoto island - - -	- 124	Toamara point - - -	- 95
Tema reef - - -	- 176	Toataa shoal - - -	- 76
Temae lake - - -	- 83	Toau island - - -	- 136
Temsino reef - - -	- 70	-----, passes, anchorage, cau-	
Temakota pass - - -	- 136	tion - - -	- 137
Temanu, mount - - -	- 26	Tohauu basin, point, beacon -	- 69
Temarauri pass, Tahiti - -	- 68	Tohivea peak - - -	- 83
Tematangi island - - -	- 117	Toini pass, village - - -	- 130
Temeranga point, Rapa - -	- 32	Tomotai pass, valley - -	- 73

	Page		Page
Tonarutu, mount - - -	35	Utu Turoa point - - -	82
Tongareva island, reef, anchorages -	171	Utuhaihai point - - -	57
-----, passes, population	172	Utuofai village - - -	78
-----, tides - - -	173	Utuoroa harbour, <i>see</i> Teavarua -	91
Topaze, mount - - -	102		
Topiro pass - - -	65	Vaekao bay - - -	165
Torea islet - - -	94	Vahanga island - - -	115
Totorahau pass - - -	34	Vahinatika pass, village - - -	129
Trade wind tables - - -	24, 25	Vahio - - -	102
Traitor's bay - - -	155	Vahitahi island - - -	120
Transit of Venus site, Oahu -	227	Vaieho harbour - - -	94
-----, Tahiti - - -	55	Vaiaia valley - - -	72
Tuamotu archipelago, general 4, 104-144		Vaiannaua point - - -	34
-----, population -	104	Vaiarava valley - - -	72
-----, winds -	105	Vaiatu pass, port, Tahiti -	72
-----, tides, currents	106	Vaieo bay, Ua-pu - - -	158
Tuanaka atoll - - -	130	Vaierapa bay - - -	85
Tuarea point - - -	85	Vaieora island - - -	90
Tuauru valley - - -	55	Vaiere pass, Murea bay -	86
Tubai island, <i>see</i> Motu iti -	97	Vaihi pass - - -	78
Tubua bay - - -	91	Vaionifa, mount, pass - -	74
Tubuai or Austral islands - 4, 32-37		Vaiote valley - - -	73
-----, products -	33	Vairaatea island - - -	120
-----, winds -	33	Vairaharaha river - - -	67
----- island, anchorage -	35	Vairao port - - -	71
----- Manu island - - -	87	Vaitahu bay, directions -	150
Tuleiava pass - - -	143	-----, anchorage, landing, water -	151
Tumakohua pass - - -	134	Vaitake bay - - -	159
Tupapaurau pass, Murea -	86	Vaitape village - - -	96
Tupua island, point - - -	95	Vaitepiha river - - -	74
Tureia island - - -	117	Vaitoore port - - -	78
Turi, mount - - -	88	----- ravine - - -	77
Turtle island - - -	175	Vaitoto point, river - - -	74
Turret rock - - -	199	----- valley - - -	73
Tutakiore bank - - -	129	Vaituha bay - - -	167
Tutataroa pass, Tahiti - - -	73	Vana Vana island - - -	117
Tutu islet - - -	135	Vapea pass, Tubuai - - -	36
Tuuhora village, Anaa - - -	132	Variaruru islet - - -	79
Tuuroto bay - - -	93	Vatui island, <i>see</i> Atiu - - -	42
Two rocks - - -	210	Vavitao island - - -	33
Two groups - - -	123	-----, depths, directions, anchorage, tides -	34
		Venus bluff, Fatu-hiva - - -	148
Ua Huka island, anchorages -	159	----- point, light, Tahiti -	55
--- Pu island - - -	156-158	Victoria island - - -	177
-----, anchorages -	157-158	Vi-pi-hai bay - - -	155
-----uka bay, valley - - -	163	Vigia - - -	16
Uniform system of beaconage, French	19	Vincennes island - - -	135
Upolu point - - -	202	Virgin bay, <i>see</i> Hana-vave -	149
Ura island - - -	139		
Urufura village, bay - - -	85		



**LIST OF SAILING DIRECTIONS, &c., PUBLISHED  
BY THE HYDROGRAPHIC DEPARTMENT OF  
THE ADMIRALTY, JUNE 1900.**

<i>Title.</i>		<i>Price.</i>
<b>GENERAL.</b>		<i>s. d.</i>
Ocean passage book, 1st edition, 1895	- - -	1 6
<b>BRITISH ISLANDS.</b>		
Channel Pilot, part 1. South-west and south coasts of England, 9th edition, 1899	- - -	2 6
----- 2. Coast of France and the Channel islands, 6th edition, 1897	- - -	3 6
Supplement, 1900	- - -	- -
North Sea Pilot, part 1. Shetland and Orkneys, 4th edition, 1894	- - -	2 6
Supplement, 1898	- - -	0 6
----- 2. North and East coasts of Scotland, 5th edition, 1895	- - -	4 6
Revised Supplement, 1900	- - -	0 6
----- 3. East coast of England, from Berwick to the North Foreland, including the Estuary of the Thames, and rivers Thames and Medway, 6th edition, 1896	- - -	3 0
Supplement, 1900	- - -	- -
----- 4. Shores of the North Sea from Calais to the Skaw, 6th edition, 1901. ( <i>In progress.</i> )	- - -	- -
Sailing directions for the West coast of Scotland, Cape Wrath to Mull of Galloway, including the Hebrides or Western islands, 4th edition, 1894	- - -	4 0
Hydrographic Notice, No. 3, of 1897	- - -	0 2
Sailing directions for the West coast of England, from Scilly isles to the Mull of Galloway, also the Isle of Man, 5th edition, 1901. ( <i>In progress</i> )	- - -	6 0
Irish Coast Pilot, 1893	- - -	3 6
Supplement, 1898	- - -	0 6
<b>NORTH OF EUROPE AND BALTIC SEAS.</b>		
Norway Pilot, part 1. The Naze to Christiania; thence to the Kattegat, 3rd edition, 1897	- - -	4 0
----- 2. From the Naze to North cape, thence to Jacob river, 2nd edition, 1894	- - -	5 6
Supplement, 1897	- - -	0 8
Arctic Pilot, vol. 1, sailing directions for the Barents, Kara, and White seas, comprising also the North coast of Russia from the Jacob river, to the Yenisei, 1st edition, 1898	- - -	6 0
Baltic Pilot, part 1, containing directions for the Kattegat, the Sound, Belts, and channels to the Baltic, 3rd edition, 1895	- - -	5 6
Supplement, 1900. ( <i>In progress.</i> )	- - -	- -
----- part 2, comprising the Baltic sea, the gulf of Finland, and the gulf of Bothnia, 3rd edition, 1896	- - -	4 6
Supplement, 1900.	- - -	2 6

Title.	Price.
ATLANTIC AND MEDITERRANEAN, &c.	s. d.
Arctic Pilot, vol. 2. Containing sailing directions for the Færoe islands, Iceland, Jan Mayen and Spitzbergen and the East Coast of Greenland. ( <i>In progress.</i> )	
*Færoe Islands Pilot, 1891 - - - -	0 9
*Information relating to currents, ice, and magnetism, with general remarks on the coast of Iceland, 1891 - -	1 0
*Icelandic Pilot, part 1. Coast from Cape Reykjanes to Stigahlid, 1897 - - - -	1 0
Sailing directions for the West coasts of France, Spain, and Portugal, from Ushant to Gibraltar strait, also the African coast from cape Spartel to Mogador, 6th edition, 1900 - -	4 0
Mediterranean Pilot, vol. 1. Comprising Gibraltar strait, coast of Spain, African coast from cape Spartel to gulf of Gabes, together with the Balearic, Sardinian, Sicilian, and Maltese islands, 3rd edition, 1894 - -	5 0
Supplement, 1898 - - - -	0 4
-----2. Comprising coast of France and of Italy to the Adriatic; African coast from Jerbah to El Arish; coasts of Karamania and Syria. Together with the Tuscan archipelago, and islands of Corsica and Cyprus, 3rd edition, 1895 -	5 0
Supplement, 1898 - - - -	0 4
-----3. Comprising the Adriatic sea, Ionian islands, the coasts of Albania and Greece to cape Malen, with Cerigo islands; including the gulfs of Patras and Corinth, 3rd edition, 1899 - - - -	4 0
-----4. Comprising the Archipelago, with the adjacent coasts of Greece and Turkey; including also the island of Candia or Crete, 3rd edition, 1900. ( <i>In progress.</i> )	
Sailing directions for the Dardanelles, sea of Marmara, Bosphorus, and Black Sea, 5th edition, 1900. ( <i>In progress.</i> )	
NORTH AMERICA AND WEST INDIES.	
Newfoundland and Labrador Pilot. Comprising also the strait of Belle-isle, the North-east and part of the North coasts of Labrador, 3rd edition, 1897 - - - -	6 6
Supplement, 1899 - - - -	1 0
Sailing directions for the South-east coast of Nova Scotia and bay of Fundy, 4th edition, 1894 - - - -	4 0
St. Lawrence Pilot, vol. 1. Containing sailing directions for the gulf and river St. Lawrence, 6th edition, 1894 - - - -	3 6

\* Will be superseded by Arctic Pilot, Vol. 2.

<i>Title.</i>	<i>Price.</i>
<i>s. d.</i>	
<b>NORTH AMERICA AND WEST INDIES—<i>cont.</i></b>	
St. Lawrence Pilot, vol. 2. Containing sailing directions for the southern parts of the gulf of St. Lawrence, and for its south entrance through Chedabucto bay and the gut of Canso, 6th edition, 1895 -	3 6
Sailing directions for the East coast of the United States of America, from the bay of Fundy to cape Canaveral, 1st edition, 1899 -	3 6
West India Pilot, vol. 1. From cape Orange in Brazil to cape Sable in Florida, with the adjacent islands, 5th edition, 1893 -	3 0
Hydrographic Notice, No. 2, of 1896 -	1 0
-----2. The Caribbean sea, from Barbados to Cuba, with Florida strait, Bahama, and Bermuda islands, 5th edition, 1899	6 0

#### **SOUTH AMERICA AND PACIFIC OCEAN.**

South America Pilot, part 1. East Coast of South Africa, from cape St. Roque to cape Virgins, with the Falkland, South Georgia, Sandwich, and South Shetland islands; also the North coast from cape St. Roque to cape Orange, in French Guiana, 4th edition, 1893 -	4 0
Supplement, 1896 -	0 6
-----2. Comprising Magellan strait, Tierra del Fuego, and West coast of South America from cape Virgins to Panama bay, also the Galápagos islands, 9th edition, 1895 -	7 6
Supplement, 1898 -	0 6
Sailing directions for the West coasts of Central America and the United States from the Bay of Panama to Juan de Fuca strait, 1st edition, 1896 -	3 0
British Columbia Pilot. Coast of British Columbia from Juan de Fuca strait to Portland canal, together with Vancouver and Queen Charlotte islands, 2nd edition, 1898 -	5 6
Supplement, 1899 -	0 6
Sailing directions for Bering sea and Alaska, 1st edition, 1898 -	4 0

#### **AFRICA.**

Africa Pilot, part 1. From cape Spartel to the river Cameroon, including the Azores, Madeira, Canary, and cape Verde islands, 6th edition, 1900 -	4 0
-----2. From the river Cameroon to the Cape of Good Hope, including Ascension, St. Helena, Tristan da Cunha, and Gough islands, 4th edition, 1893 -	3 6
Hydrographic Notice, No. 2, of 1897 -	0 8
-----3. South and East coasts of Africa from the cape of Good Hope to cape Guardafui, also islands in the main route through Mozambique channel, 6th edition, 1897 -	4 0
Supplement, 1900. ( <i>In progress.</i> ) -	-

Title.		Price.	
INDIAN OCEAN, &C.		s.	d.
Red Sea and Gulf of Aden Pilot. Containing description of the Suez Canal, the Gulfs of Suez and Akabah, the Red Sea and strait of Báb-el-Mandeb, the Gulf of Aden with Sokótra and adjacent islands, and part of the Eastern Coast of Arabia, 5th edition, 1900. ( <i>In progress.</i> )			
Persian Gulf Pilot. The gulf of Omán, and the Makran coast, 4th edition, 1898	- - - - -	4	0
West coast of Hindustan Pilot, including the gulf of Manár, the Maldive and Lakadive islands, 4th edition, 1899	- - - - -	4	0
Bay of Bengal Pilot. Containing sailing directions for the bay of Bengal, and the adjacent coasts of Hindustan, Burma, and Siam, together with Ceylon, the Nicobar, and Andaman islands, and the north coast of Sumatra, 3rd edition, 1901	- - - - -		
Islands in the Southern Indian ocean westward of longitude 80° E., including Madagascar, 1891	- - - - -	5	0
Supplement, 1898	- - - - -	0	9
CHINA SEA, AUSTRALIA, NEW ZEALAND.			
China Sea Directory, vol. 1. Containing approaches to the China sea, by Malacca, Singapore, Sunda, Banka, Gaspar, Carimata, Rhio, Berhala, and Durian straits, 4th edition, 1896	- - - - -	4	0
Supplement, 1899	- - - - -	0	8
2. Directions for the China sea between Singapore and Hong-Kong, 4th edition, 1899	- - - - -	4	0
3. Comprising the coast of China, from Hong-Kong to the Korea; north coast of Luzon, Formosa island and strait; the Babuyan, Bashi, and Meiacó Sima groups; Yellow sea, gulfs of Pechili and Liautung. Also the rivers Canton, West Min, Yung, Yangtse, Yellow, Pei Ho, and Liau Ho, and Pratas island, 3rd edition, 1894	- - - - -	4	6
Supplement, 1898	- - - - -	0	4
4. Comprising the coast of Korea, Russian Tartary, Japan islands, gulfs of Tartary and Amur, and the sea of Okhotsk; also the Meiacó, Liukiu, Linschoten, Mariana, Bonin, Saghalin, and Kuril islands, 3rd edition, 1894	- - - - -	3	6
Supplement, 1898	- - - - -	0	4
Eastern Archipelago, part 1. Comprising the Philippines, Sulu archipelago, North-east coast of Borneo, Celebes sea, North-east coast of Celebes, Molucca and Gillolo passages, Banda and Aráfura seas, North-west and West coasts of New Guinea, and North coast of Australia, 1st edition, 1890	- - - - -	4	6
Revised Supplement, 1898	- - - - -	1	0

<i>Title.</i>		<i>Price.</i>	
CHINA SEA, AUSTRALIA, NEW ZEALAND— <i>cont.</i>		<i>s. d.</i>	
Eastern Archipelago, part 2.	Comprising the South-east coast of Sumatra, Java, the islands east of Java, Celebes, and the South and East coasts of Borneo, 1st edition, 1893 - - -	5	0
	Supplement, 1899 - - -	0	8
Australia Directory, vol. 1.	South and East coasts, Bass strait, and Tasmania, 9th edition, 1897 - Supplement, 1900 - - -	5	0
-----	2. Comprising the East coast from Sydney to Torres strait. Torres strait. Coral sea. Also a part of Carpentaria gulf, 5th edition, 1898 -	4	0
-----	3. North, North-west, and West coasts, from the gulf of Carpentaria to cape Leeuwin, with directions for passages through the neighbouring seas, 3rd edition, 1895 - - - Supplement, 1898 - - -	4	6
		0	3
New Zealand Pilot, including also the Chatham islands, and the off-lying islands southward of New Zealand, 7th edition, 1900. ( <i>In Progress.</i> )			
Pacific Islands, vol. 1 (Western groups).	Sailing directions for the South-east, North-east, and North coasts of New Guinea, Louisiade, and Solomon islands, Bismarck archipelago, Caroline and Mariana islands, 3rd edition, 1900 -	5	0
----- vol. 2.	Containing sailing directions for New Caledonia, Loyalty islands, Bank, Torres, and Santa Cruz Groups, Fiji islands, Tonga, Samoa, Union, Phoenix, Ellice, Gilbert, and Marshal Groups, 3rd edition, 1900 - - -	-	-
----- vol. 3.	Sailing directions for the Tubuai, Cook, and Society islands; Tuamotu or Low archipelago; Marquesas; Line islands or scattered islands near the equator, and the Sandwich or Hawaiian islands, 3rd edition, 1900 - - -	-	-

## TABLES.

Towson's great circle tables - - - - -	1	0
Sun's true bearing or azimuth tables (Burdwood) between the parallels of 30° and 60° inclusive, 1894 - - -	4	6

## DEVIATION OF THE COMPASS, &amp;c.

Practical rules for ascertaining and applying the deviation of the compass, 1892 - - - - -	0	6
Admiralty manual for ascertaining and applying the deviations of the compass, 6th edition, 1893 - - - - -	3	0
Questions and answers relating to the compass, 1898 - - - - -	0	6



	<i>Title.</i>	<i>Price.</i>
<b>LIST OF LIGHTS.--Corrected annually to the 31st December.</b>		<b>s. d.</b>
Part I.—	British islands - - - - -	1 6
Part II.—	North and White seas - - - - -	2 0
Part III.—	Baltic - - - - -	2 0
Part IV.—	Western shores of Europe and Africa from Dunkerque to the Cape of Good Hope, including Azores, Madeira, Canary, Cape Verde islands, &c. -	1 6
Part V.—	Mediterranean, Black, Azov, and Red seas - -	1 6
Part VI.—	South Africa, East Indies, China, Japan, Australia, Tasmania, and New Zealand - - - -	2 0
Part VII.—	South America, western coast of North America, Pacific islands, &c. - - - -	1 0
Part VIII.—	Eastern shores of North America and Central America from Labrador to the river Amazon, including Bermuda and islands of the West Indies	2 6

## TIDES.

Tide tables for British and Irish ports, and also the times of high water for the principal places on the Globe (published annually) - - - - -	2 0
Notes on the tidal streams at the entrance of the English channel	1 0

## MISCELLANEOUS.

Catalogue of charts, plans, and sailing directions, corrected annually to 31st December - - - - -	1 0
Admiralty manual of scientific enquiry - - - - -	2 6
Signs and abbreviations adopted in the Admiralty charts - -	0 6
Remarks on revolving storms, 3rd edition, 1883 - - - -	0 3
List of time signals established in various parts of the world, 1898 - - - - -	1 0
Distances and heights - - - - -	0 6
Dock book, containing dimensions of the wet and dry docks, patent slips, &c., of the world, with information relating to shipbuilding and engineering works, 1900 - - - -	
On the Station pointer, and the manner of fixing a ship's position by its aid, 1886 - - - - -	0 6
Notes bearing on the navigation of H.M. ships, 1893 - - -	0 2
Index to Notices to Mariners, 1899 - - - - -	1 0

## ADMIRALTY AGENT FOR THE SALE OF CHARTS.

LONDON	-	-	J. D. Potter	-	-	31, Poultry E.C.
"	-	-	"	-	-	11, King Street, Tower Hill, E.

## SUB-AGENTS.

*(In the United Kingdom.)*

BARRY	-	-	T. L. Ainsley	-	-	1, Tip.
BELFAST	-	-	F. M. Moore	-	-	102, High Street.
BRISTOL	-	-	C. W. Price	-	-	1 & 2, Broad Quay.
CARDIFF	-	-	T. J. Williams	-	-	3, Bute Docks.
"	-	-	F. L. Ainsley	-	-	Primavesi Chambers, James Street.
"	-	-	Wilson & Gillie Bruce & Son	-	-	107, Bute Street.
"	-	-	Dobbie, Hutton & Gebbie	-	-	47, George Street.
CORK	-	-	A. W. Sutton & Co.	-	-	46, Warren Place.
COWES (WEST)	-	-	Pascall, Atkey, & Son	-	-	20, High Street.
"	"	"	G. H. May & Co.	-	-	126 & 127, High Street.
DARTMOUTH	-	-	Cranford & Son	-	-	Library, Fairfax Place.
DOVER	-	-	C. Clout	-	-	135, Snargate Street.
DUBLIN	-	-	Hodges, Figgis, & Co., Ltd.	-	-	104, Grafton Street.
"	-	-	F. M. Moore	-	-	23, Eden Quay.
DUNDEE	-	-	P. A. Feathers & Son	-	-	43, Dock Street.
FALMOUTH	-	-	Williams & Co.	-	-	The Quay.
GLASGOW	-	-	Whyte, Thomson, & Co.	-	-	144, Broomielaw.
"	-	-	A. Dobbie & Son	-	-	45, Clyde Place.
"	-	-	D. McGregor & Co.	-	-	37, Clyde Place.
GREENOCK	-	-	R. Love	-	-	17, West Blackhall Street.
"	-	-	A. Dobbie & Son	-	-	28, Cathcart Street.
GRIMSBY	-	-	O. T. Olsen	-	-	Fish Dock Road.
HARTLEPOOL	-	-	G. Pearson	-	-	24, High Street.
HARWICH	-	-	John Groom & Son	-	-	Lloyd's Agents.
HULL	-	-	Newton Brothers	-	-	Prince's Dock.
"	-	-	W. Hakes	-	-	Commercial Road.
LEITH	-	-	D. Stalker	-	-	6 & 8, Commercial Street.
LIVERPOOL	-	-	Philip, Son & Nephew	-	-	49 & 51, South Castle St.
"	-	-	John Parks & Son	-	-	43, Canning Place.
"	-	-	Frodsham & Keen	-	-	31, South Castle Street.
"	-	-	John Bruce & Son	-	-	60, South Castle Street.
"	-	-	D. McGregor & Co.	-	-	39, South Castle Street.
LONDON	-	-	J. Imray & Son	-	-	156, Minories, E.
"	-	-	E. Stanford	-	-	26, Cockspur Street, S.W.
LONDONERRY	-	-	E. A. Minniece	-	-	23, Ship Quay Street.
MARYPORT	-	-	Quinton Moore	-	-	Harbour House.
MIDDLESBROUGH	-	-	Constantine, Pickering & Co.	-	-	Docks.
NEWCASTLE-ON-TYNE	-	-	M. S. Dodds	-	-	61, Quayside.
"	"	"	S. A. Cail & Sons	-	-	29 & 31, Quayside.
NEWPORT, MON.	-	-	E. E. Williams	-	-	94, Dock Street.
NORTH SHIELDS	-	-	Wilson & Gillie	-	-	New Quay.
OBAN	-	-	Hugh Macdonald	-	-	"Times" Office, Esplanade.
PLYMOUTH	-	-	G. E. Hicks	-	-	17, Southside Street.
PORTSEA	-	-	Griffin & Co.	-	-	2, The Hard.
PORTSMOUTH	-	-	C. Groom, Ltd.	-	-	50, Broad Street.
QUEENSTOWN	-	-	T. Miller	-	-	1, Harbour Row.
SOUTHAMPTON	-	-	S. W. Wolff	-	-	76, High Street.
"	-	-	J. G. Fay & Co., Ltd.	-	-	80 & 90, High Street.

SUB-AGENTS. (*In the United Kingdom.*)

SUNDERLAND -	- T. Reed & Co. -	- 184, High Street West.
" -	- J. J. Wilson & Son -	- 18 & 19, Hudson Road.
SOUTH SHIELDS -	- T. L. Ainsley -	- Mill Dam.
SWANSEA -	- F. Martin -	- 1 & 10, Somerset Place.

SUB-AGENTS. (*Abroad.*)

AMSTERDAM -	- L. J. Harri -	- Prins Hendrikkade, No. 90.
BERLIN - -	- D. Reimer -	- 29, Wilhelm Strasse.
" - -	- A. Asher & Co. -	- 13, Unter den Linden.
BREMERHAVEN -	- W. Ludolph -	- 72, Smidt Strasse.
BRISBANE -	- Watson & Ferguson -	- Queen Street.
CAPE TOWN -	- J. C. Juta & Co. -	- Booksellers.
" - -	- C. G. Molinary -	- Shipchandler.
GIBALTAR -	- Mercer & Skaugen -	- Dock Road.
HAGUE, THE -	- Van Cleef Brothers -	- Libraries.
HAMBURG -	- Eckhardt & Messtorff -	- Steinhof I.
" - -	- Thos. Downie -	- 9, Stubbenhuk.
" - -	- Friederichsen & Co. -	- 61, Neuer Wall.
HAVRE -	- V. & M. Lepetit -	- 13 & 15, Rue de Paris.
HOBART (TASMANIA) -	- Walch & Sons -	- Merchants.
HONG-KONG -	- C. J. Gaupp & Co. -	- Booksellers.
" - -	- Messrs. G. Falconer & Co. -	- Queen's Road, Central.
MALTA - -	- Collector of Customs -	- Custom House.
MARSEILLES -	- A. Rabier -	- 17, Quai de la Fraternité.
MELBOURNE -	- J. Donne & Son -	- 346, Little Collins Street.
MONTREAL -	- Hearn & Harrison -	- 1640 & 1642, Notre Dame Street.

## NEWCASTLE (N.S.W.)

NEW YORK -	- John Bliss & Co. -	- 128, Front Street.
PARIS - -	- Galignani Library -	- 224, Rue de Rivoli.
" - -	- Augustin Challamel -	- 17, Rue Jacob.
PORT ADELAIDE -	- A. E. Sawtell -	- Divett Street.
PORT ELIZABETH -	- J. C. Juta & Co. -	- Booksellers.
PORT NATAL -	- Lewis J. Wilson -	- The Point.
PORT SAID -	- C. J. Vella & Co. -	- Shipping Agents.
" - -	- The Anglo-American Book-selling Depot -	- Shipping Agents.
QUEBEC -	- T. J. Moore & Co. -	- 118 & 120, Mountain Hill.
SAINT JOHN (NEW BRUNSWICK).	- A. B. Smalley -	- 91, Prince William Street.
SAINT JOHN'S (NEW-FOUNDLAND).	- Ayre & Son -	- 231, Water Street.
" - -	- George Knowling -	- Shipping Agent.
SHANGHAI - -	- Lane, Crawford & Co. -	- Merchants.
" - -	- Hirsbrunner & Co. -	- 1, Nankin Road.
" - -	- Kelly & Walsh -	- Shipping Agents.
SINGAPORE -	- Hon. Sec. & Treasurer -	- Sailors' Home.
SUEZ - -	-	-
SYDNEY, N.S.W. -	- Turner & Henderson -	- 16 & 18, Hunter Street.
TOKYO -	- Takata & Co. -	- Merchants.
TORONTO -	- Charles Potter -	- 31, King Street.
VANCOUVER CITY, B.C. -	- Thomson Stationery Co. -	- 108, Cordova Street.
" ISLAND -	- Hibben & Co. -	- 66, Government Street, Victoria.
ZANZIBAR -	- Port Officer -	- Port Office.





UNIVERSITY OF MICHIGAN



3 9015 07341 5856

